Service Manual

Sliding Arm Paper Roll Clamps

Manual Number 667446

cascade® corporation

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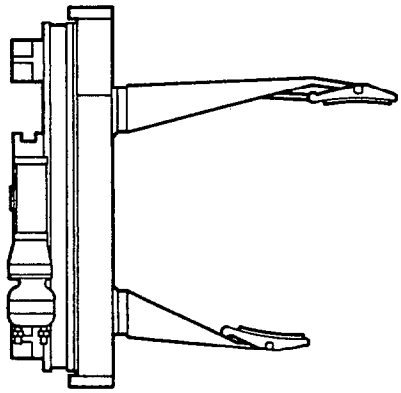
Section 1 Introduction

This manual provides the installation instructions, periodic maintenance requirements, troubleshooting procedures, and service guides for Cascade Sliding Arm Paper Roll Clamps. The models covered are:

- Long-and-Short-Arm Models C3P, C4P, and C6P
- Parallarm (Short-and-Swinging) Models C3P, C4P, C5P, and C6P
- "Dockhand" (equal-length arms) Models C4P (rotating) and C4S (sideshifting)

Each Sliding Arm Paper Roll Clamp is a hydraulically-actuated, two-function lift truck attachment designed for paper roll handling.

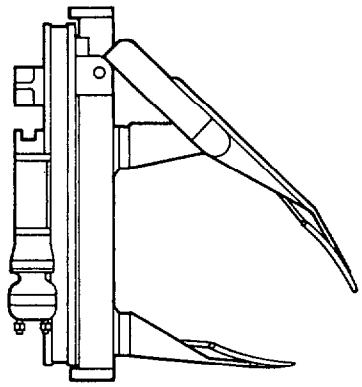


Long-and-Short Arm

1.1 Truck System Requirements

Pressure: Your lift truck should supply sufficient hydraulic pressure to handle the heaviest load. PRESSURE MUST NOT EXCEED 2000 PSI.

Volume: **C3P**—10 gpm
C4P, C5P—15 gpm
C6P—20 gpm



Parallarm (Short-and-Swing Arm)

1.2 Special Instructions Definitions

⚠WARNING

A statement preceded by **⚠WARNING** is information that should be acted upon to prevent **bodily injury.** A **WARNING** is always inside a ruled box.

CAUTION

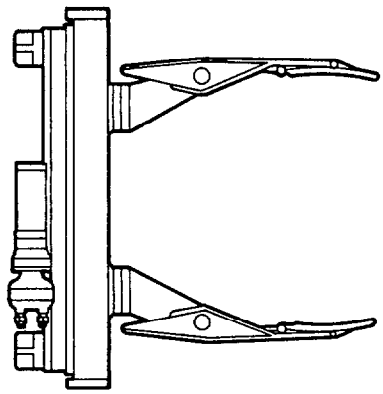
A statement preceded by **CAUTION** is information that should be acted upon to prevent **machine damage.**

IMPORTANT

A statement preceded by **IMPORTANT** is information that possesses special significance.

NOTE

A statement preceded by **NOTE** is information that is handy to know and may make your job easier.



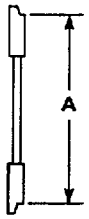
Dockhand (Equal Length Arms)

Section 2 Installation Instructions

WARNING: Rated capacity of the truck/attachment combination is a responsibility of the original truck manufacturer and may be less than that shown on the attachment nameplate. Consult the truck nameplate.

2.1 Truck System Requirements

- Truck relief valve setting: 2000 psi maximum.
- Volume: **C3P**—10 gpm
  C4P, C5P—15 gpm
  C6P—20 gpm
- Recommended hose and fitting size: No. 8 (1/2 inch ID) with minimum fitting orifices of 13/32 inch.
- Truck carriage must conform to the Industrial Truck Association (ITA) dimensional standards as shown in the following chart.



Mounting	Dimension A (in.)	
	Min.	Max.
Class II (C3P, C4P, C4S)	14.94	15.00
Class III (C4P, C4S, C5P, C6P)	18.68	18.74
Class IV (C6P)	23.44	23.50

- Make sure the truck carriage is clean and the notches are undamaged.

Section 2 Installation Instructions

2.2 Prior to Installation

1. Install the hydraulic hoses to the **truck junction blocks** using the correct Cascade Attachment Installation Kit (C-663532 for C4S Sideshifting "Dockhands," C-663585 for all other clamps).

   OR,

   use hoses and fittings as shown in Figure 1 or 2. Be careful not to pinch, twist, or otherwise damage the hoses.

IMPORTANT

In order to conform to industry standard practice, the hoses should be connected to the truck auxiliary valves as indicated by the following chart.

Function, in order of location from operator	Attachment Movement	Motion of the operator's hand
Rotate	Clockwise	Rearward or Up
	Counter-clockwise	Forward or Down
Clamp	Clamp	Rearward or Up
	Release	Forward or Down

NOTE: The Junction Blocks On Your Truck May Be Reversed From Those Shown.

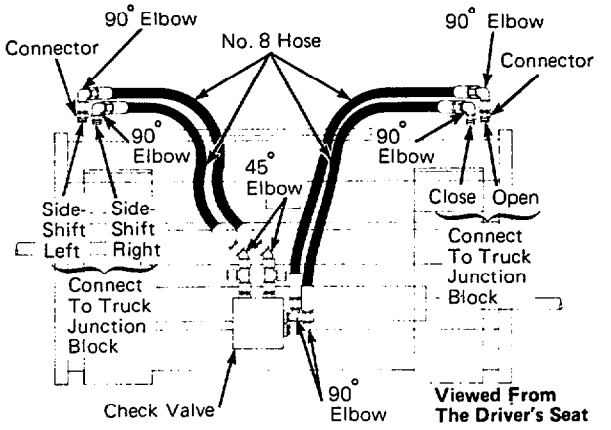
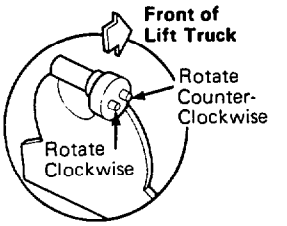


Figure 1. Plumbing Diagram, Model C4S Sideshifting Dockhand



NOTE: The Junction Blocks On Your Truck May Be Reversed From Those Shown

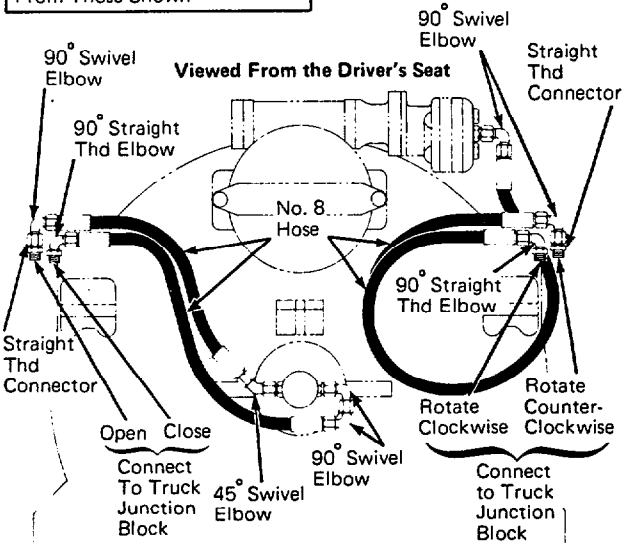


Figure 2. Plumbing Diagram, Models C3P, C4P, and C6P

CAUTION:

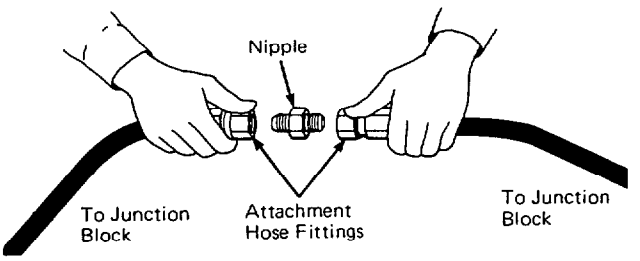
2. Flush the hoses as follows to prevent damage to the rotator motor and the revolving connection (check valve on sideshifting Dockhands).

   a. Connect the hoses that go to the rotator motor together.

   b. Connect the hoses that go to the revolving connection together.

   c. On sideshifting Dockhands, connect each pair of hoses from the truck junction blocks together.

   d. Start the truck and actuate both truck control valves in both directions for about 30 seconds to carry any debris left in the hoses to the truck hydraulic tank and filter.



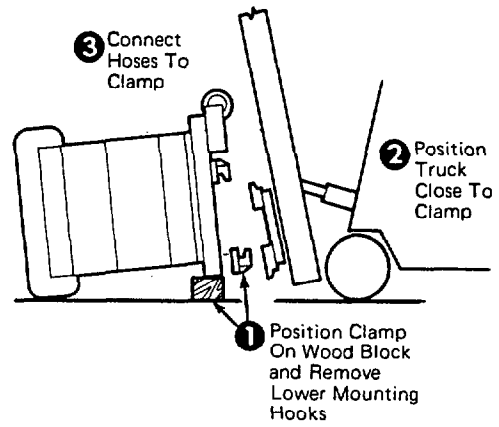
Section 2 Installation Instructions

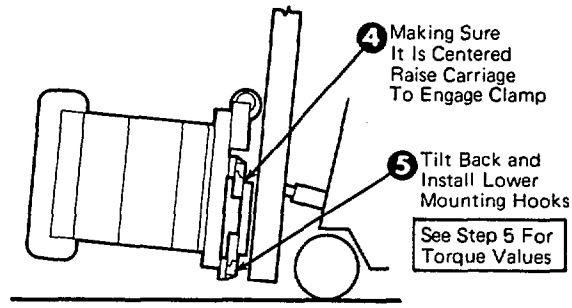
2.3 Installation

1. Using a suitable hoist and chain, position the clamp as shown and remove the lower mounting hooks.
2. Position the truck close enough so the hoses on the junction blocks can be connected to the attachment.
3. Connect the hoses to the attachment as shown in Figure 1 or 2.
4. Raise the truck carriage and engage the attachment upper mounting hooks. Make sure the centering block on the attachment aligns with the center notch on the carriage.

   IMPORTANT: Some models have a positioning block welded to the upper left-hand mounting hook. Center the attachment on the carriage, making sure the positioning block is engaged in a notch on the carriage.
5. Tilt the mast back and install the lower mounting hooks. Lube-torque the capscrews as follows:

C3P	74-76 ft.-lb.
C4P Sideshifting Dockhand and C5P	64-69 ft.-lb.
All others	85-90 ft.-lb.

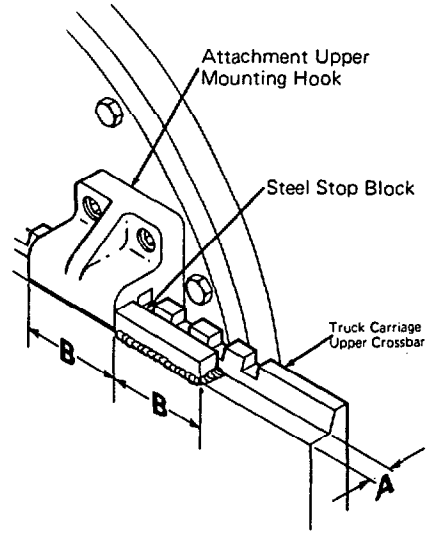



4 Making Sure It Is Centered Raise Carriage To Engage Clamp
5 Tilt Back and Install Lower Mounting Hooks
See Step 5 For Torque Values

2.4 Attachment Stop Blocks

Cascade recommends that steel stop block kit C-669344 be permanently welded on each side of the truck carriage upper crossbar adjacent to each attachment upper mounting hook. To perform the installation:

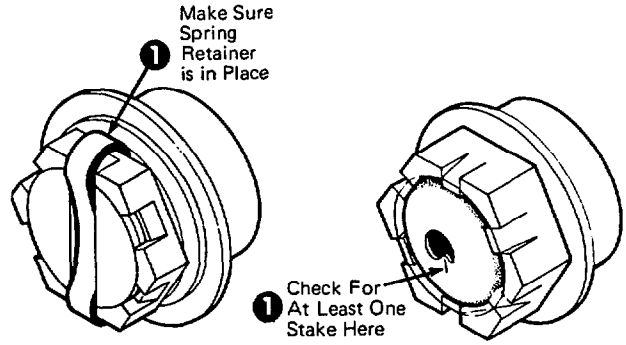
1. Position the blocks adjacent to the upper mounting hooks. The blocks should not extend behind the flat of the carriage upper crossbar (dimension A).
2. Weld the blocks in place. Make sure you protect adjacent hoses and hydraulic components from weld splatter.



2.5 Prior to Operation

1. Check the cylinder anchor nuts to make sure they are secure. If your clamp has old-style anchor nuts, make sure the spring retainer is in place. If you have new-style anchor nuts, make sure they are properly staked.
2. Before picking up a load, operate the attachment through a full cycle to force any air from the system to the truck hydraulic tank. Check for leaks.
3. Pick up a maximum load and operate the clamp. If the clamp does not function correctly, recheck the plumbing. If the clamp drops the load, contact Cascade's Service Department, telephone 800-547-5266 (toll-free), or, in Oregon, call 666-1511.

WARNING: Make sure there are no people in the vicinity of the attachment when picking up a load.


1 Make Sure Spring Retainer is in Place
1 Check For At Least One Stake Here
OLD-STYLE CYLINDER ANCHOR NUT
NEW-STYLE CYLINDER ANCHOR NUT

Section 3 Periodic Maintenance

3.1 100 Hour Maintenance

Every time the lift truck is serviced or every 100 hours of truck operation, whichever comes first, complete the following maintenance procedures.

- ☐ Check the cylinder anchor nuts for security.
- ☐ Check the edge of the contact plates for wear or sharp nicks that could damage or tear paper rolls. Replace the contact plates if necessary.
- ☐ Check the pivot pins securing the contact plates and contact plate links. If a concentration of wear is visible, replace the pins.

IMPORTANT:
After completing any service procedure, always test each function through 5 complete cycles. First test the clamp empty to bleed excess air trapped in the system. Then test each function with a load to make sure the clamp operates correctly before returning it to the job.

3.2 500 Hour Maintenance

After each 500 hours of lift truck operation, in addition to the 100-hour maintenance procedures, perform the following procedures.

- ☐ Lubricate the ring gear/bearing assembly with wheel bearing grease (except C4S sideshifting Dockhands). Rotate the clamp one full turn during lubrication.
- ☐ Remove the plug on the back of the baseplate and retorque all the ring gear/bearing assembly capscrews to 65-70 ft.-lb. (except C4S sideshifting Dockhands). Replace the plug.
- ☐ Remove the plug on the side of the rotator drive gear-case and fill to capacity with Cascade Rotator Drive Lubricant (Cascade part number C-656300) or Keystone WG-1 (except C4S sideshifting Dockhands). Replace the plug.
- ☐ Retorque the mounting hook capscrews. Use the torque specifications shown in Section 2.

3.3 1000 Hour Maintenance

After each 1000 hours of lift truck operation, in addition to the 100-hour and 500-hour maintenance procedures, perform the following procedures.

- ☐ Check the arm bushings. If they are worn, marred, or deeply scratched, replace the bushings.
- ☐ Check the swing-arm and Dockhand-arm pivot bushings. If bushings are scored or worn, replace them.
- ☐ Check swing-arm and Dockhand-arm pivot pins. If the chrome plating is pitted or worn through, replace the pins.

3.4 2000 Hour Maintenance

After each 2000 hours of lift truck operation, in addition to the 100-hour, 500-hour, and 1000-hour maintenance procedures, perform the following procedure.

- ☐ Replace all sliding arm bushings.

Section 4 Troubleshooting

4.1 General Procedures

WARNING: Before servicing any hydraulic component, relieve pressure in the system. Open the arms 1 or 2 inches, turn the truck off, and open the truck auxiliary valves several times in both directions.

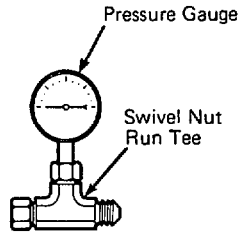
After completing any service procedure, always test the unit through several cycles. First test the attachment empty to bleed air trapped in the system to the truck system. Then test the attachment with a load to be sure it operates correctly before returning it to the job.

Stay clear of the load while testing. Do not raise the load more than 3 inches off the floor while testing.

4.1-1 Truck System Requirements

Pressure: Your lift truck should supply sufficient hydraulic pressure to handle the heaviest load. PRESSURE MUST NOT EXCEED 2000 PSI.

Volume: **C3P**—10 gpm
C4P, C5P—15 gpm
C6P—20 gpm



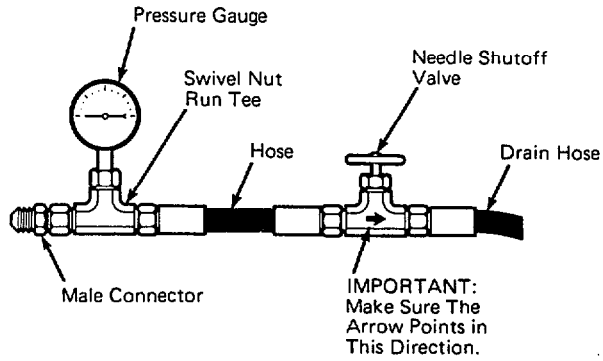
4.1-2 Tools Required

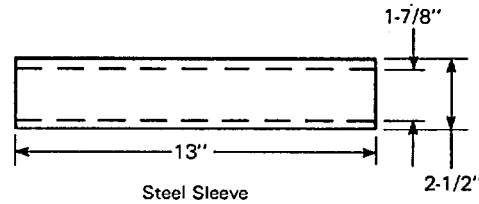
In addition to a normal selection of hand tools, you will need:

- Two pressure gauges capable of measuring pressure to 2500 psi.
- Two No. 6 swivel nut run tees (37° JIC) suitable for mounting gauges.
- Two No. 8 swivel nut run tees (37° JIC) suitable for mounting gauges.
- Two needle shutoff valves, rated for 2500 psi service, minimum. (Recommended supplier for needle shutoff valves: Marsh Instrument Co., Skokie, Ill.)
- Two steel sleeves as shown by the accompanying illustration

Install the gauges in the tees. Use No. 6 tees for troubleshooting clamping circuits and use No. 8 tees for troubleshooting rotator circuits.

For some tests, you will install the needle valves and drain lines in conjunction with the No. 6 gauge arrangements.





4.1-3 Get All The Facts Before You Begin Working On The Clamp

It is important that you gather all the facts regarding the problem before you begin service procedures. The best way is to talk with the operator. Ask for a complete description of the malfunction. The following guidelines will help you decide where to begin your troubleshooting procedures.

A. Clamp Circuit

- Clamp drops the roll after it has been picked up.
- Clamp will not carry rolls up to its rated capacity.
- Clamp arms will not function properly.

If you encounter one of these problems, refer to Paragraph 4.3.

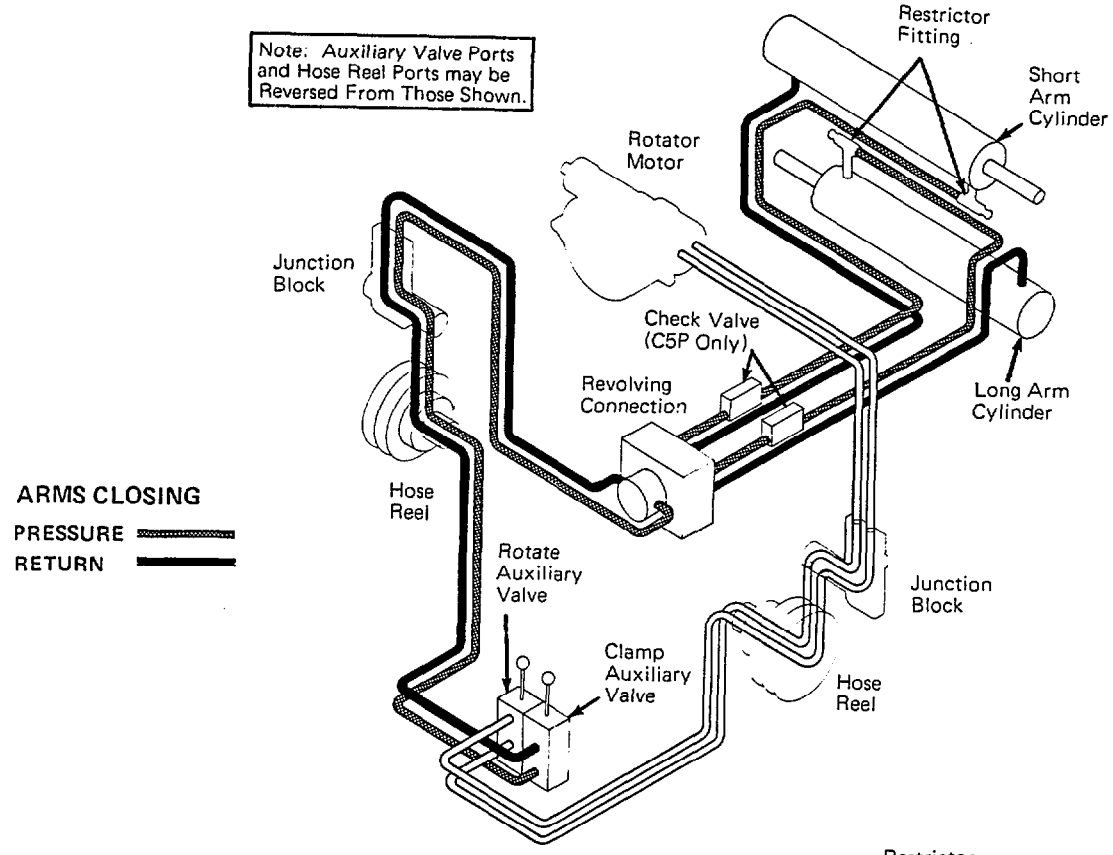
B. Rotate Circuit (except C4S Dockhand)

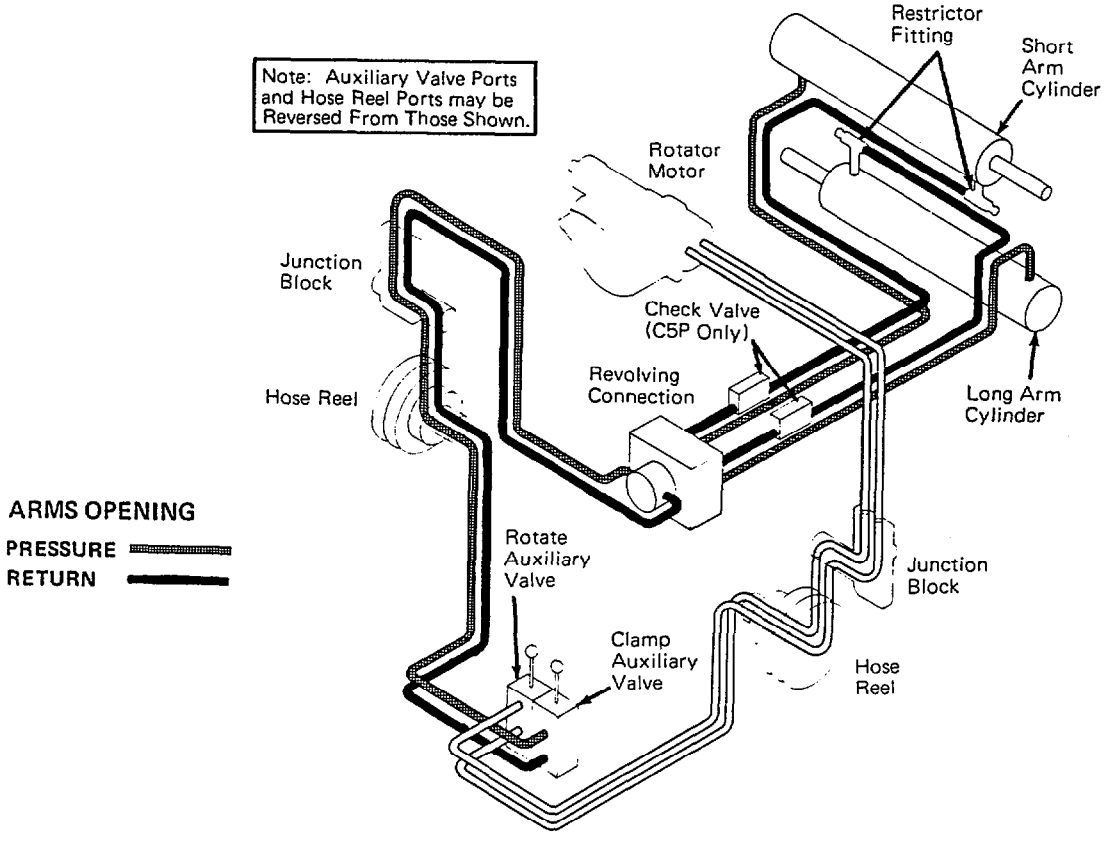
- Clamp will not rotate.
- Clamp will not rotate rolls up to its rated capacity.
- Clamp rotates in one direction only.

If you encounter one of these problems, refer to Paragraph 4.4.

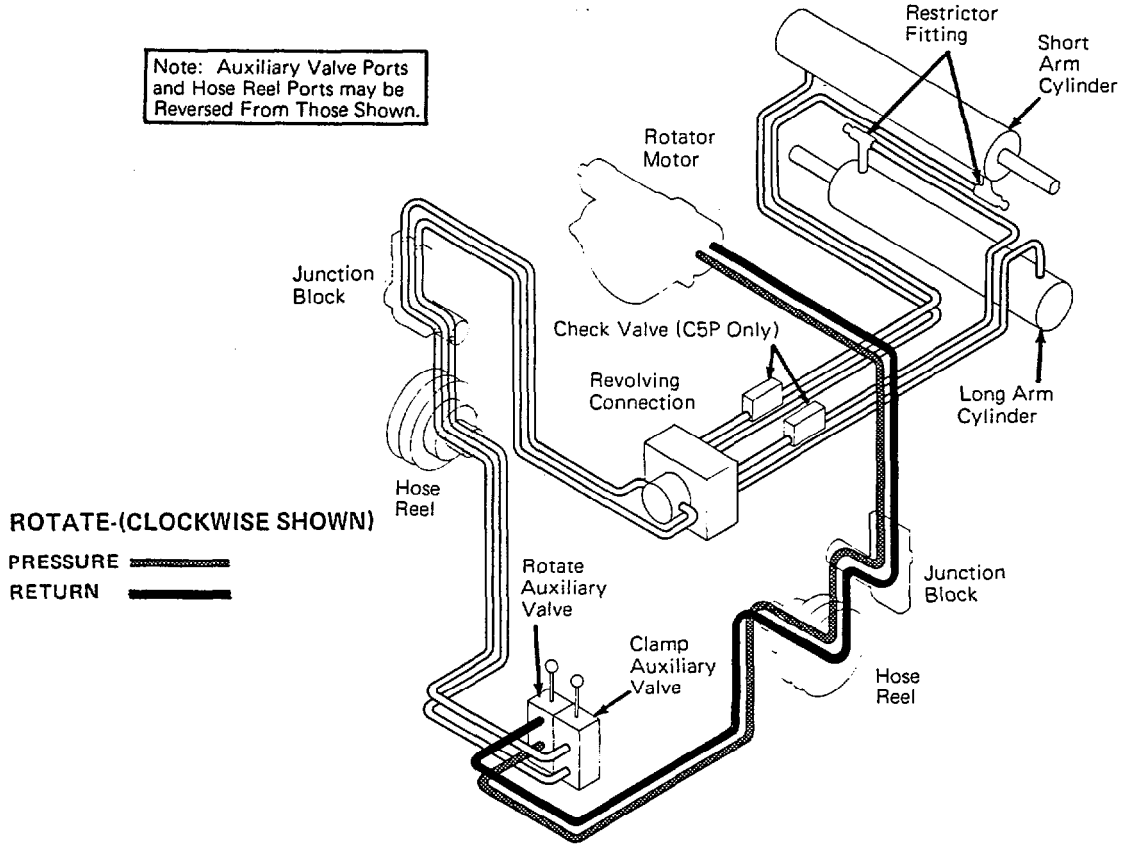
4.2 Plumbing

4.2-1 Hosing Diagram, All Except C4S Dockhand

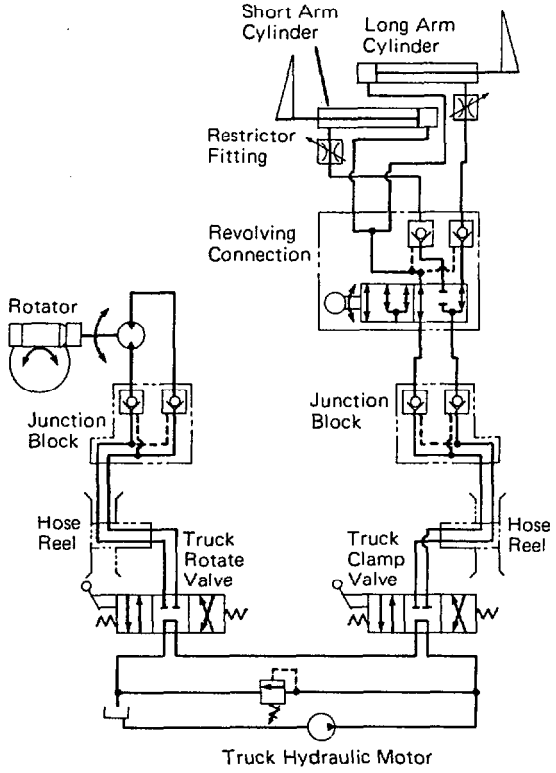


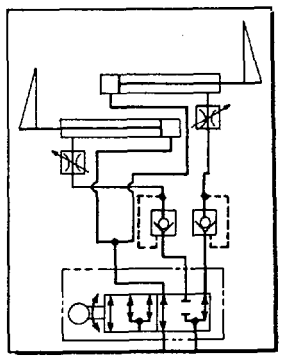


4.2-1 Hosing Diagram, All Except C4S Dockhand (Cont.)



4.2-2 Circuit Schematic, All Except C4S Dockhand

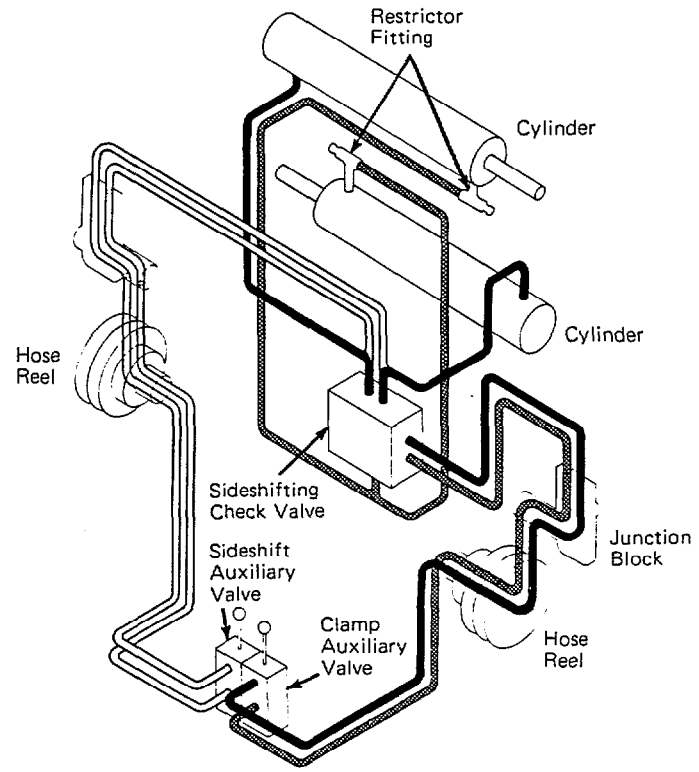




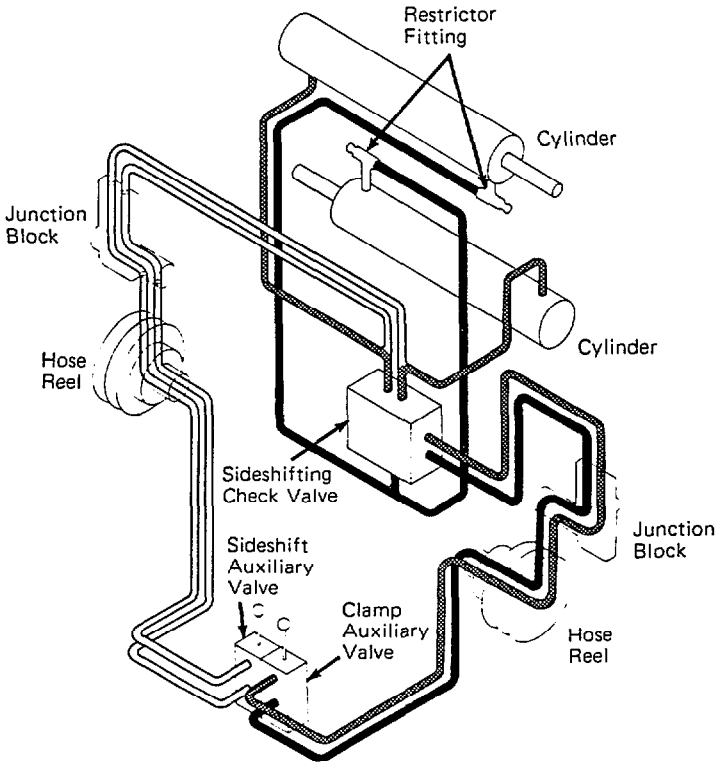
C5P ONLY
Revolving Connection does not have integral check valves; check valves are separate components.

4.2-3 Hosing Diagram, C4S Sideshifting Dockhand

ARMS CLOSING
PRESSURE
RETURN



ARMS OPENING
PRESSURE
RETURN

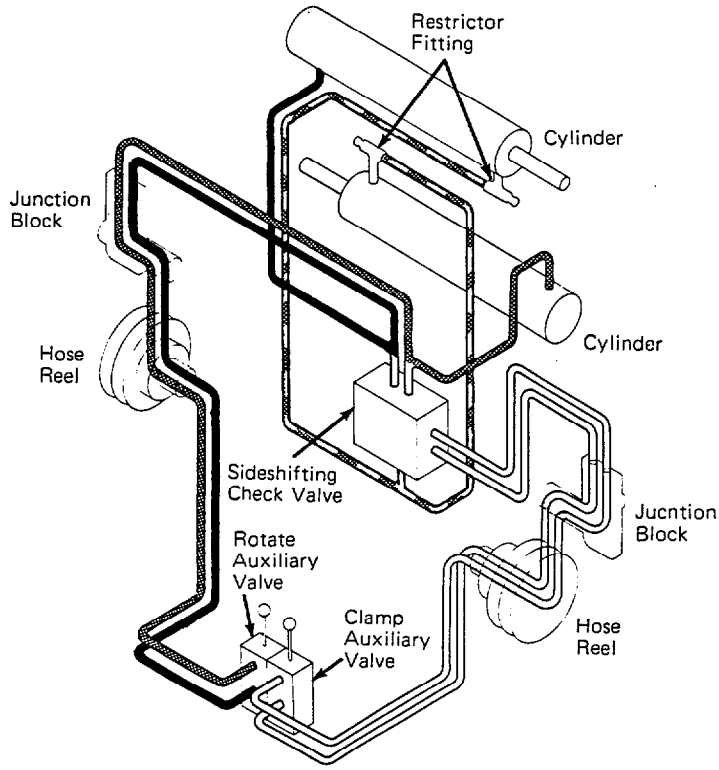


4.2-3 Hosing Diagram, C4S Sideshifting Dockhand (Cont.)

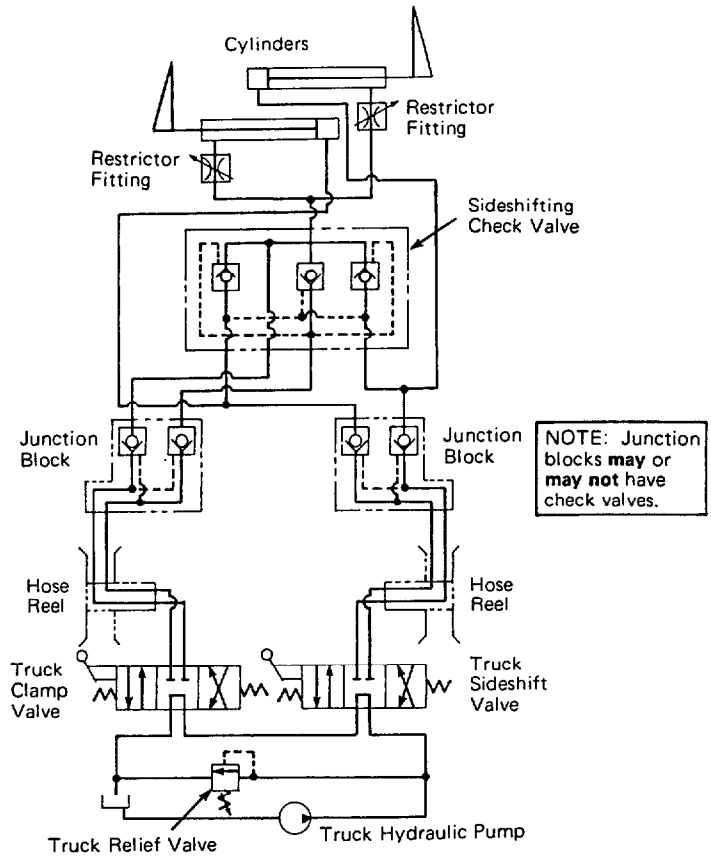
SIDESHIFTING
(SIDESHIFT LEFT SHOWN)

PRESSURE

RETURN



4.2-4 Circuit Schematic, C4S Sideshifting Dockhand



4.3 Clamp Circuit Troubleshooting

There are four potential problem areas that could affect clamping force.

- Insufficient hydraulic pressure.
- External leaks.
- Malfunctioning check valves.
- Worn or defective cylinder seals.

To isolate the problem area, complete the following check list in the **exact** sequence indicated.

General Pressure Test

☐ To test the clamp system, rotate the attachment so the arms are side-by-side (for vertical roll handling). Open the arms fully.

☐ Remove the bumper plate from the front of the attachment.

☐ Remove the arm cylinder rod-end nuts.

IMPORTANT: Refer to the procedures described in Section 5, Paragraph 5.2-1, Step 2.

☐ Retract the cylinders far enough to slip the steel sleeves over the cylinder rods.

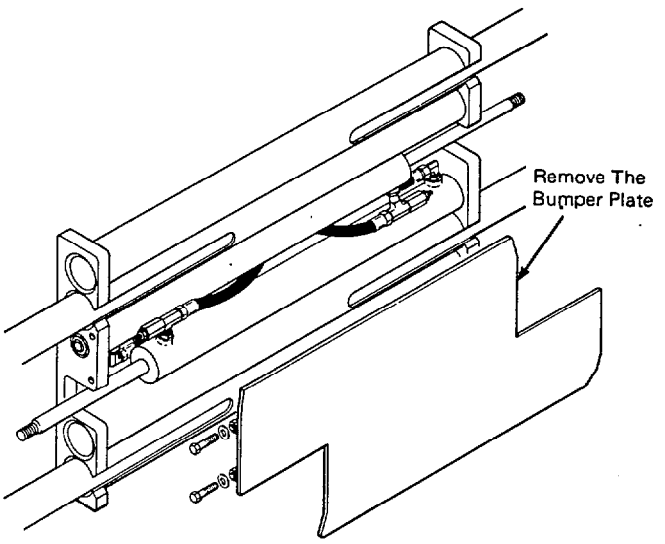
☐ Extend the cylinders and reconnect the rods to the arms. It is not necessary to "lock" the nuts or install the keepers.

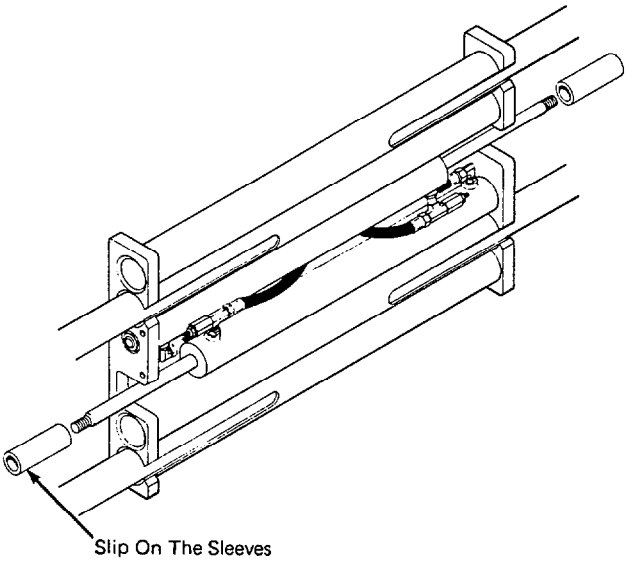
☐ Remove the supply hose to the rod end port of both arm cylinders. Install the gauges into the open ports, then connect the cylinder supply hoses to the gauge tees.

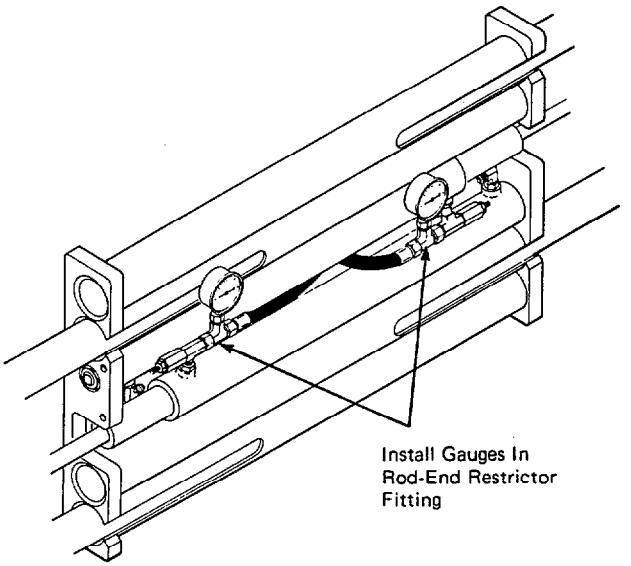
☐ Slowly retract the cylinders (arms moving together) until the sleeves contact the cylinder ends. Make sure the gauge assemblies do not interfere with the closing arms. The cylinders are now blocked partially extended.

☐ Pull the clamp control handle to the "clamp" position and hold for a few seconds.

☐ Return the handle to neutral. The gauges should register within 100 psi of specified truck pressure. If they do not, check the pressure delivered by the truck. Refer to the truck service manual. Adjust and repair as necessary. TRUCK PRESSURE MUST NOT EXCEED 2000 PSI. Recheck cylinder pressures.

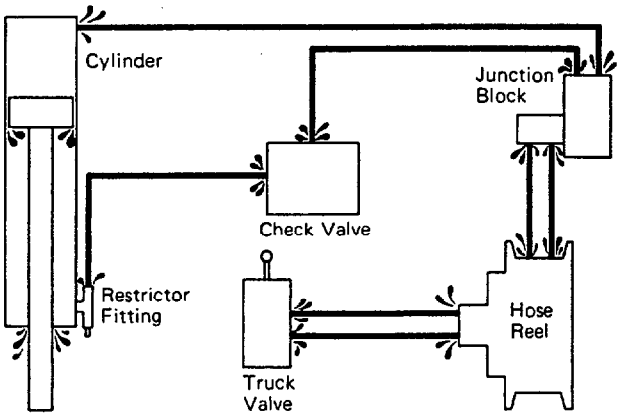




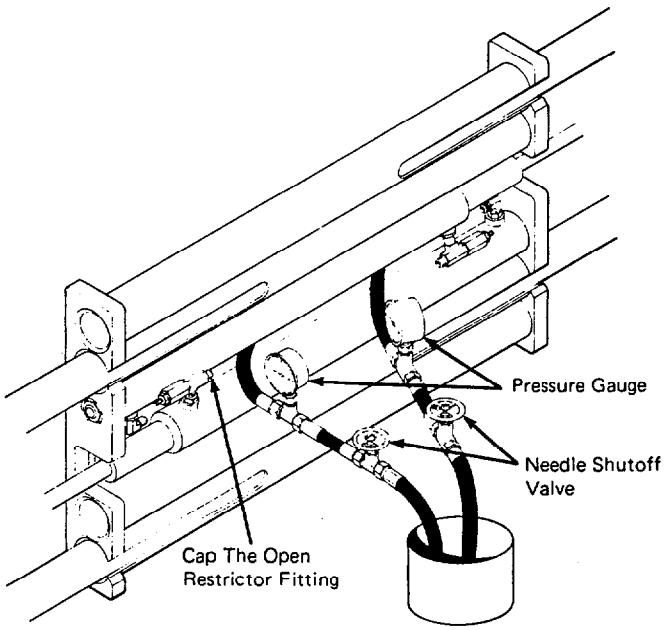


General Pressure Test (Cont.)

- ☐ If the truck system is OK, watch the gauges. If either or both registers a drop of more than 100 psi in one minute, check for external leaks in the system. Refer to the accompanying diagram. Repair the leaks and recheck cylinder pressure. If there are no external leaks, test the check valves as follows.
- ☐ Remove the gauges from the cylinder rod-end ports. Keep the gauges connected to the cylinder supply hoses. Cap the open cylinder rod-end ports.
- ☐ Attach the needle shutoff valves and drain lines to the gauge tees. Put the drain lines into a suitable container. Open the needle valves no more than 1/2 to 1 full turn.
- ☐ With the truck idling, pull the clamp control handle to "clamp." Wait 4 or 5 seconds, then close the needle valves tightly. Continue holding the clamp handle for a moment to allow clamping circuit pressure to reach the full truck relief setting.
- ☐ Watch the gauge.
  - If the gauges do **not** drop more than 100 psi in one minute, the cylinder seals are leaking. Refer to Section 5, Paragraph 5.3 for service procedures.
  - If the gauges drop more than 100 psi in one minute, the check valve is faulty. Refer to Section 5, Paragraph 5.6 for service procedures (Paragraph 5.7 for C4S Dockhands).
- ☐ After making the necessary corrections, remove the cylinder rod sleeves, reconnect all hoses, and replace the bumper plate. Make sure the cylinder anchors are secure. Refer to Section 5, Paragraph 5.2-1, Step 7 for special instruction regarding cylinder anchor nuts.
- ☐ Cycle the attachment 4 or 5 times without and with a load before returning the attachment to service.



POTENTIAL EXTERNAL LEAK POINTS



Call Cascade's Service Department

If you have carefully and accurately completed this check list and you still have not solved the problem, call us. Our Service Department is open from 10:00 AM to 8:00 PM **Eastern time.**

Call 800-547-5266 (toll free)
In Oregon, 666-1511

Section 4 Troubleshooting

4.4 Rotate Circuit Troubleshooting (except C4S Dockhand)

To isolate the problem area in the rotation system, complete the following check list.

4.4-1 Problem

Clamp will not rotate or will not rotate rolls up to its rated capacity.

Probable causes:

- Insufficient truck hydraulic pressure.
- Incorrect roll handling.
- Excessive back pressure in the truck hydraulic system.

Tests:

☐ Check the pressure delivered by the truck hydraulic system. A pressure drop of no more than 100 psi below truck relief valve setting at the auxiliary valve port is OK. If the pressure is not as specified, refer to the truck service manual for adjustment or service. PRESSURE MUST NOT EXCEED 2000 PSI.

☐ Make sure the operator is gripping the roll as shown in the illustration. Gripping a roll, especially a long one, near its end, then attempting to rotate it requires a tremendous amount of torque—often times beyond the capacity of the clamp.

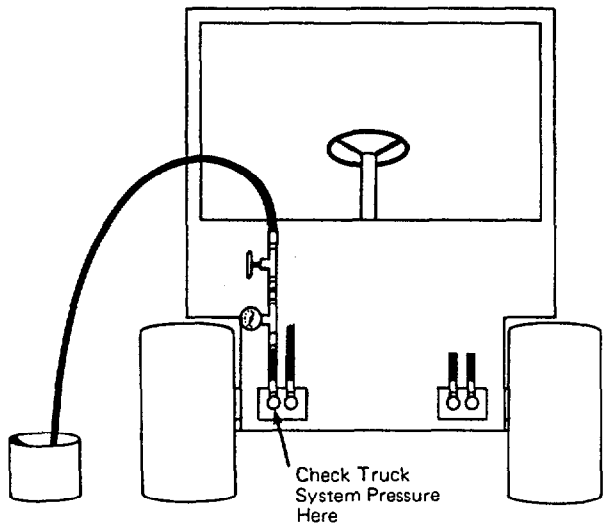
☐ Install a pressure gauge into each port of the hydraulic motor (do not use the needle valve).

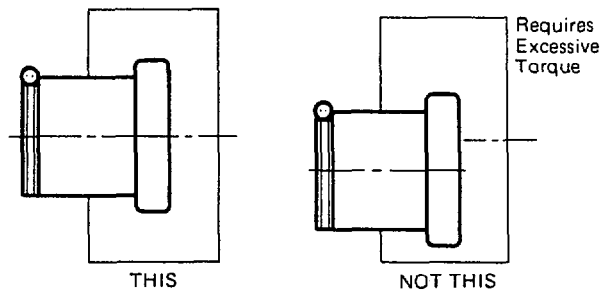
☐ Securely grip a roll that weighs close to the capacity of the clamp.

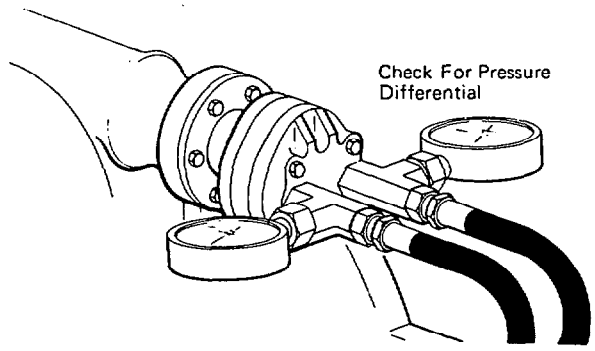
☐ Rotate the roll and note the pressure readings on the gauges during rotation.

If the lower pressure reading EXCEEDS 200 psi, you have excessive back pressure in your supply circuit. Check for restrictions such as numerous fittings and elbows, hose sizes less than No. 8, clogged oil filter, etc.

If the lower pressure does NOT EXCEED 200 psi, and the truck pressure is within specifications, the hydraulic motor needs repair. Refer to Section 5, Paragraph 5.9-2 for service procedures.







4.4-2 Problem:

Clamp rotates in one direction only.

Probable cause:
The pilot spool in the junction block that supplies the rotator motor is jammed.

Solution:
Replace the junction block.

Call Cascade's Service Department

If you have carefully and accurately completed this check list and you still have not solved the problem, call us. Our Service Department is open from 10:00 AM to 8:00 PM **Eastern time.**

Call 800-547-5266 (toll free)
In Oregon, 666-1511

5.1 Clamp Removal and Installation

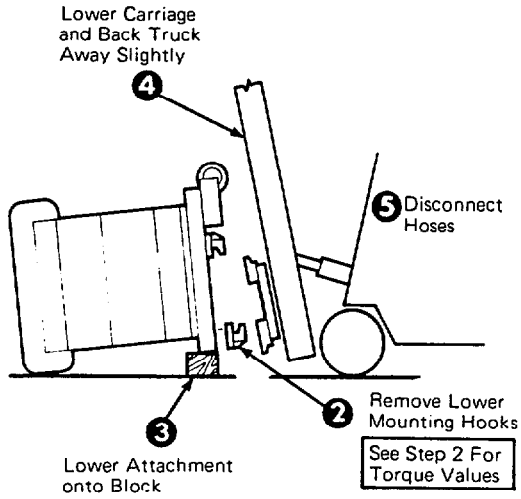
1. Make sure the attachment is rotated so the arms are positioned side-by-side (for vertical roll handling). Open the arms completely.
2. Remove the lower mounting hooks. For reassembly, lube-torque the lower mounting hook capscrews as follows:

C3P	74-76 ft.-lb.
C4P Sideshifting Dockhand and C5P	64-69 ft.-lb.
All others	85-90 ft.-lb.

3. Position a wood block under the attachment frame. Lower the mast carriage until the arm contact plates are on the floor and the frame is resting on the block.
4. After making sure the attachment is securely positioned, continue lowering the mast carriage enough to clear the upper mounting hooks. Back the truck away a few inches to gain access to the hoses to the revolving connection (check valve on C4S sideshifting Dockhands).

> **WARNING:** Before removing any hoses, relieve pressure that might be present in the hydraulic system. With the truck off, open the truck auxiliary control valves several times in both directions.

5. Disconnect and cap the hoses to the attachment. Tag the hoses for ease in reconnecting.
6. For reinstallation, reverse the above procedures, or consult Installation Instructions, Section 2.


Lower Carriage and Back Truck Away Slightly
4
5 Disconnect Hoses
2 Remove Lower Mounting Hooks
See Step 2 For Torque Values
3 Lower Attachment onto Block

5.2 Arms

5.2-1 Arm Removal and Installation

Arm removal is easiest to perform with the attachment mounted on the truck.

IMPORTANT: C5P SWING ARM CLAMPS ONLY. If you are going to disassemble the swing arm of a C5P clamp, first remove the arm from the arm carrier while it is still on the attachment frame. Refer to Paragraph 5.2-5.

1. Rotate the clamp so the arms are positioned side-by-side (for vertical roll handling).

5.2-1 Arm Removal and Installation (Cont.)

2. Fully extend the arms and remove the nuts retaining the cylinder rods to the arm lugs. On old-style retaining nuts, first remove the spring retainers.

   IMPORTANT: A new style retaining nut has a cone-shaped locking washer swaged to the threads of the nut. Locking is achieved when the washer is "dimpled" into the groove in the end of the cylinder rod. To "unlock" the nut, insert a punch or chisel into the hole in the center of the cone-shaped washer and pry up the dimple. If you're careful, the nut may be reused several times.

   NOTE: Pressurizing the cylinders outward will increase friction between the cylinder rod and the lug and may make loosening the nuts easier.

3. Secure the arms with a suitable overhead hoist and chain.

   WARNING: Make sure your overhead hoist has a rated lifting capacity of at least 1000 pounds.

4. LINK-TYPE SWING ARMS ONLY. Remove the links by removing the link pin assemblies from the arms and the attachment frame.

5. Retract the cylinder rods until they come out of engagement with the arm lugs.

6. Pull the arms out of the clamp frame.

   IMPORTANT: Each time the arms are removed, inspect the arm guide tubes on the revolving frame for scoring. Minor scoring can be removed with a hone. If the guide tubes are too badly damaged to use, the entire revolving frame must be replaced. Before installing arm carriers, make sure the guide tubes are clean and free of metal projections.

7. For reassembly, reverse the above procedures, except for the following special instructions for cylinder anchor nuts.

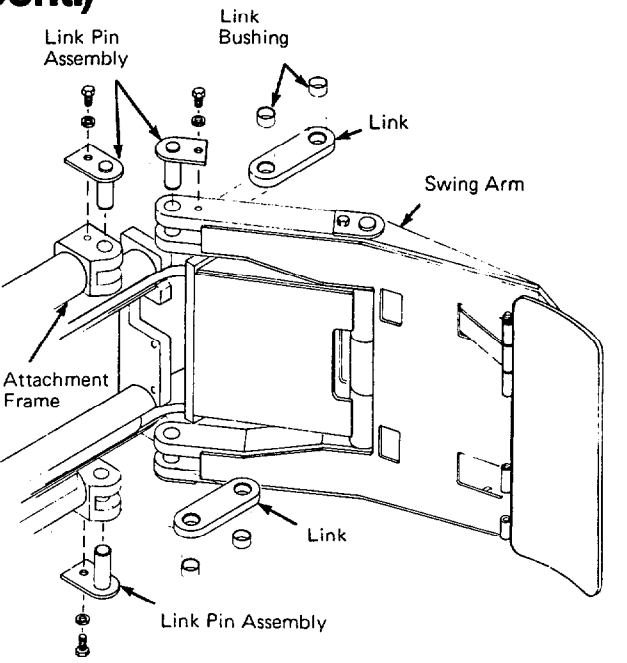
   NOTE: When tightening cylinder anchor nuts, pressurizing the cylinders outward will increase friction between the cylinder rod and the lug and may make tightening easier.

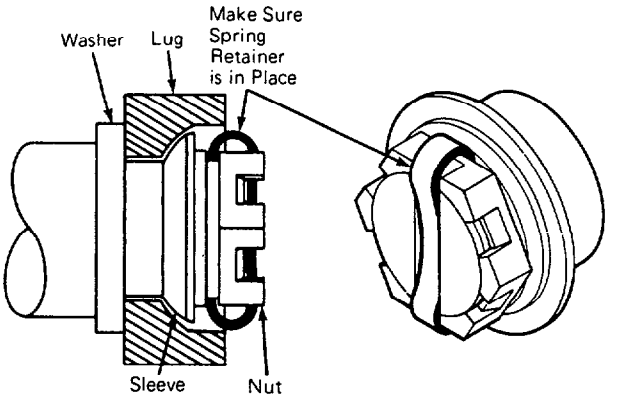
   a. OLD-STYLE ANCHOR NUTS. Install the washer onto the cylinder rod, then fit the cylinder rod into the arm carrier. Install the sleeve, then thread on the nut. Tighten the nut until the sleeve bottoms against the washer. Back the nut off until it aligns with the slot in the cylinder rod. Install the spring retainer. The clearance between the lug and the washer should be about 5/32 inch.

   CAUTION: Do not attempt to remove the looseness or damage to the assembly could result.

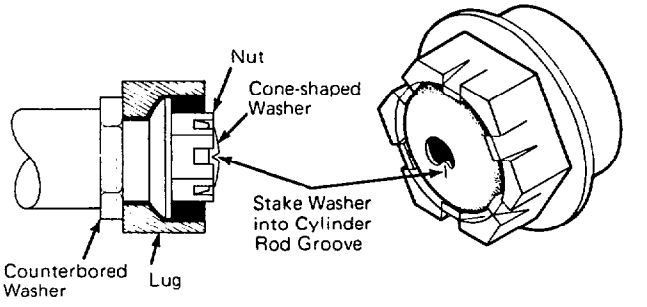
   b. NEW-STYLE ANCHOR NUTS. Install the washer onto the cylinder rod with the counterbore-side facing outward (toward the nut), then fit the cylinder rod into the arm carrier. Restrain the washer with a wrench and torque the nut to: C3P, C4P—130-150 ft.-lb., C6P—205-235 ft.-lb. Lock the nut by staking the cone-shaped washer with a case-hardened chisel. Be sure the cone-shaped washer is driven into the slot in the end of the cylinder rod.

   CAUTION: Always use the hex-style washer with the new-style anchor nut. DO NOT use the old-style castellated nut with the hex-style washer.





OLD-STYLE CYLINDER ANCHOR NUT

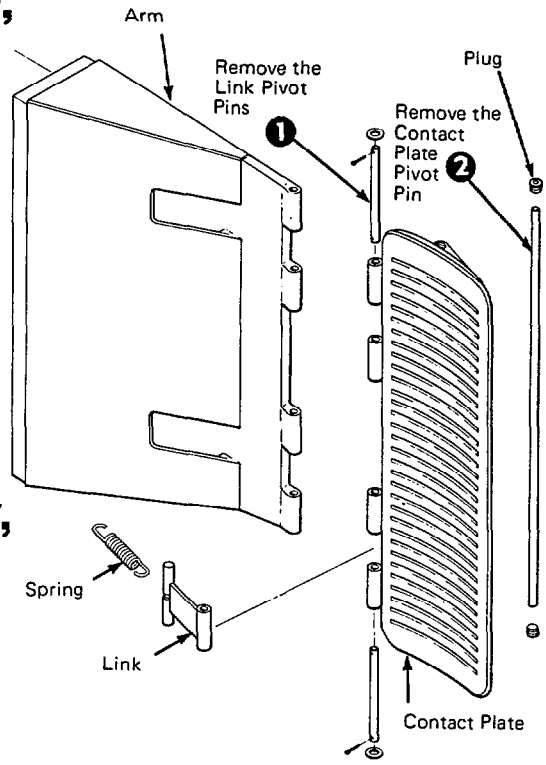


NEW-STYLE CYLINDER ANCHOR NUT

5.2-2 Arm Disassembly and Reassembly, Long-and-Short Arms

The following procedures can be performed with the attachment on the truck and with the arms on the attachment. If the arms have been removed (Paragraph 5.2-1), lay the arm assembly down with the arm vertical.

1. Remove the contact plate links by removing the link pivot pin. The links are pivoted to the inside edge of the contact plate to limit the travel of contact plate articulation.
2. Remove the contact plate by removing the contact plate pivot pin from the back of the contact plate. The pin is secured by two pipe plugs.
3. For reassembly, reverse the above procedures.



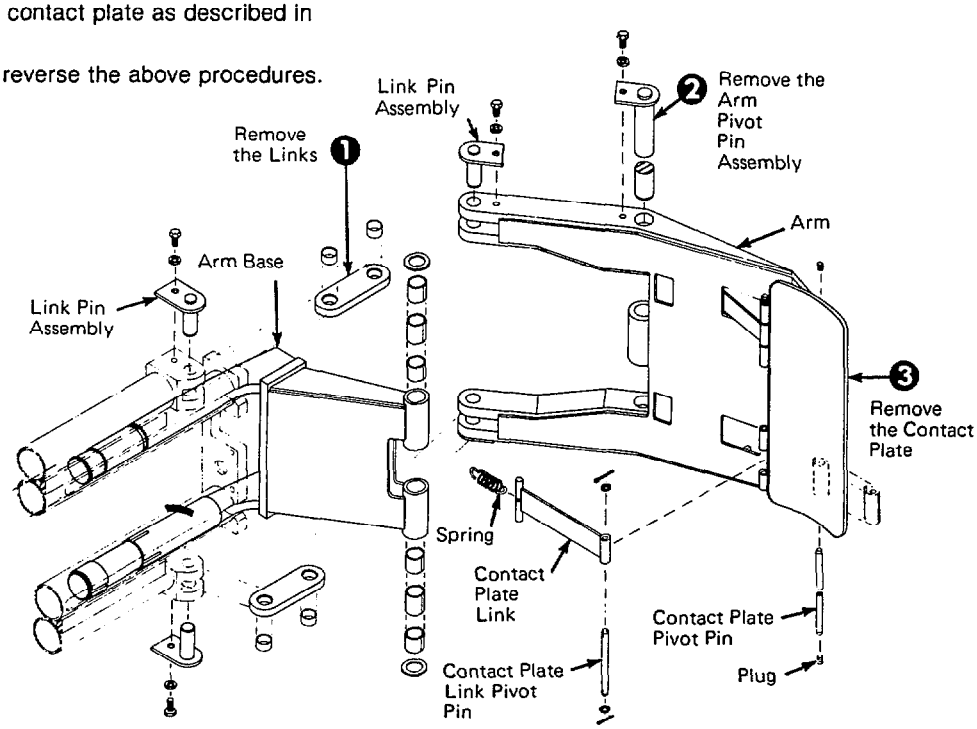
5.2-3 Arm Disassembly and Reassembly, Link-type Swing Arms

The following procedures can be performed with the attachment on the truck and with the arms on the attachment. If the arms have been removed (Paragraph 5.2-1), lay the assembly down with the arm vertical.

1. Remove the arm links (if they are not already removed) by removing the link pin assemblies from the arms and the attachment frame.

> **WARNING:** Secure the swing arm with a suitable overhead hoist and chain.

2. Remove the arm pivot pin assembly and separate the arm from the arm base.
3. Remove the arm contact plate as described in Paragraph 5.2-2.
4. For reassembly, reverse the above procedures.



Link-type Swing Arm Assembly (typical)

5.2-4 Arm Disassembly and Reassembly, Cam-type Swing Arms

The following procedures can be performed with the attachment on the truck and with the arms on the attachment. If the arms have been removed (Paragraph 5.2-1), lay the arm assembly down with the arm vertical.

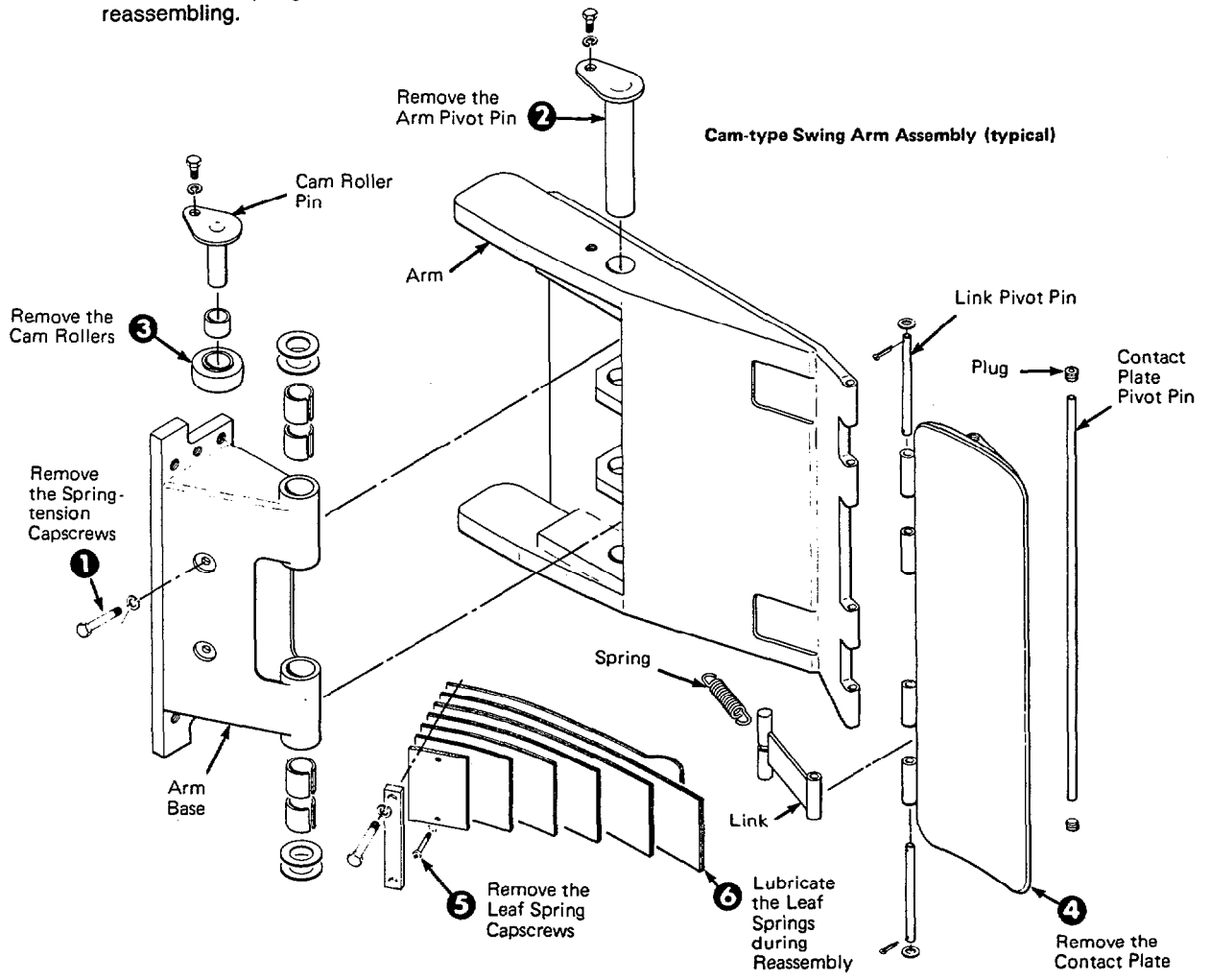
1. Remove the two capscrews from the inside of the arm base to relax the tension on the leaf spring assembly.

> **WARNING:** Secure the swing arm with a suitable overhead hoist and chain.

2. Remove the arm pivot pin assembly and separate the arm from the arm base.
3. Remove the two cam rollers from the top and bottom of the frame.
4. Remove the contact plate as described in Paragraph 5.2-2.
5. Disassemble the leaf springs by removing the two socket-head capscrews in the spring base.

   NOTE: Your unit may have a different quantity of springs than shown. During reassembly, make sure you install the same number of springs you removed.

6. For reassembly, reverse the above procedures. Lubricate the springs with graphite-base grease when reassembling.



Cam-type Swing Arm Assembly (typical)

5.2-5 Arm Disassembly and Reassembly, C5P Swing Arm

IMPORTANT: The swing arm of a C5P clamp must be disassembled as follows before removing the arm carrier from the attachment.

1. Close the arms until the swing arm closes about 20°
2. Insert a steel drift pin through the hole in the back of the arm base, then slowly close the arm until the drift pin engages a hole in the spring retainer.

> **WARNING:** Keep clear of the spring when engaging or releasing the dowel or drift pin.

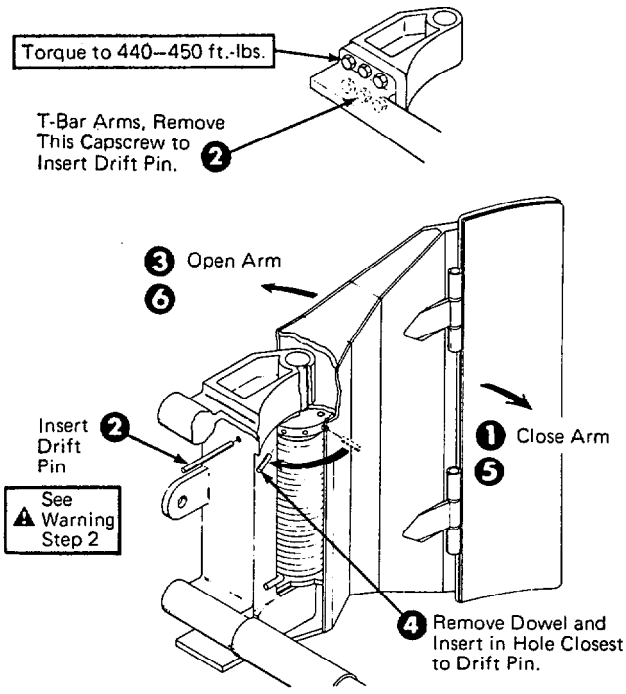
3. Open the arm until the dowel in the spring retainer can be removed.
4. Move the dowel to the hole in the spring retainer closest to the drift pin.
5. Close the arm until the drift pin can be removed.
6. Open the arm and repeat the process until the spring is completely relaxed.

> **WARNING:** Secure the swing arm with a suitable overhead hoist and chain.

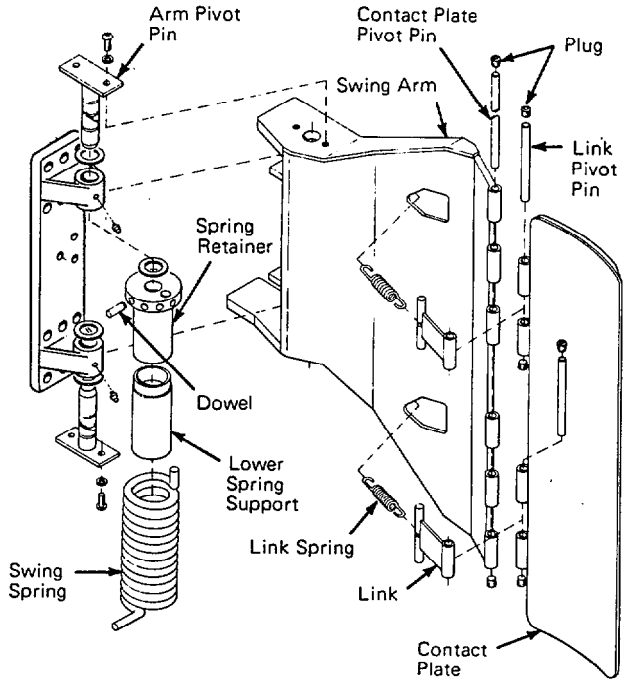
7. Remove the arm pivot pins and pull the swing arm away from the arm base.
8. Remove the contact plates as described in Paragraph 5.2-2.
9. Remove the arm carrier as described in Paragraph 5.2-1.
10. For reassembly, reverse the above procedures, except for the following special instructions for the swing arm.
11. Install the arm carrier into the attachment frame. Make sure the guide tubes are clean and free of metal projections. Refer to Paragraph 5.2-1, Step 7.
12. Assemble the arm onto the arm base with the spring relaxed (dowel removed).
13. Close the arm completely.
14. Insert a steel drift pin through the hole in the back of the arm base and engage a hole in the spring retainer.

> **WARNING:** Keep clear of the spring when engaging or releasing the dowel or drift pin.

15. Open the arms and insert the dowel into the spring retainer hole farthest from the drift pin.
16. Close the arm until the drift pin can be removed.
17. Repeat the process until one of the last two spring retainer holes can be pinned by the dowel.



C5P Swing Arm Removal



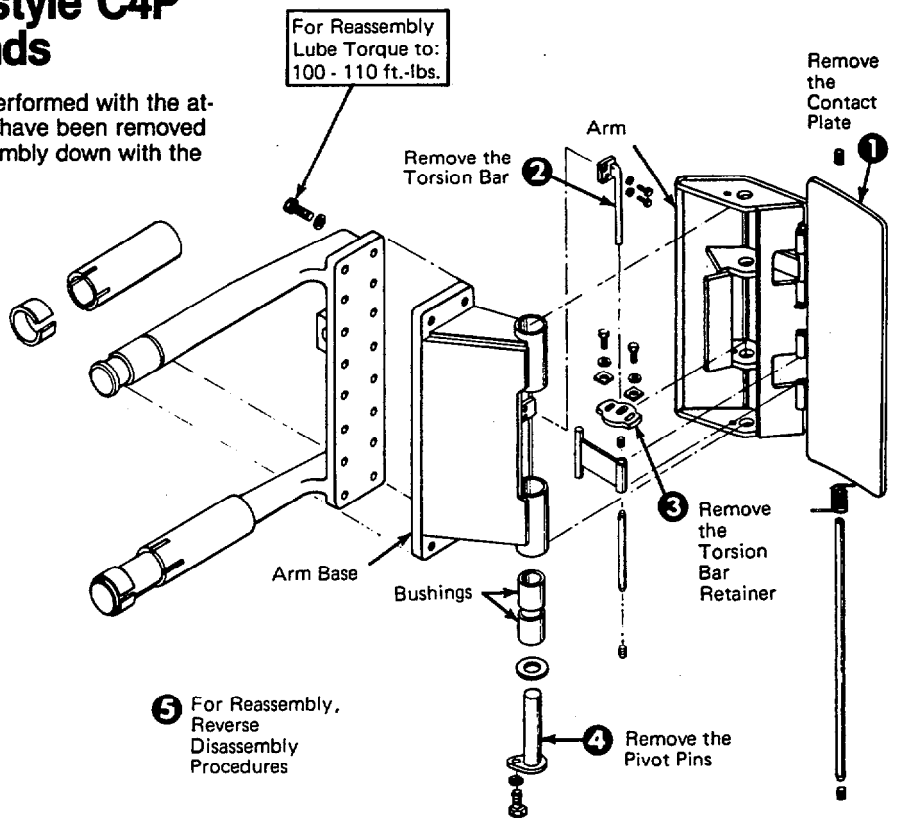
5.2-6 Arm Disassembly and Reassembly, Old-style C4P and C4S Dockhands

The following procedures can be performed with the attachment on the truck. If the arms have been removed (Paragraph 5.2-1), lay the arm assembly down with the arm vertical.

1. Remove the contact plate as described in Paragraph 5.2-2.

> **WARNING:** Secure the arm with a suitable overhead hoist and chain.

2. Remove the torsion bar from the arm pivot point.
3. Remove the torsion bar retainer from the arm pivot point.
4. Remove the top and bottom pivot pins and separate the arm from the arm base.
5. For reassembly, reverse the above procedures.



Old-Style Dockhand Arm

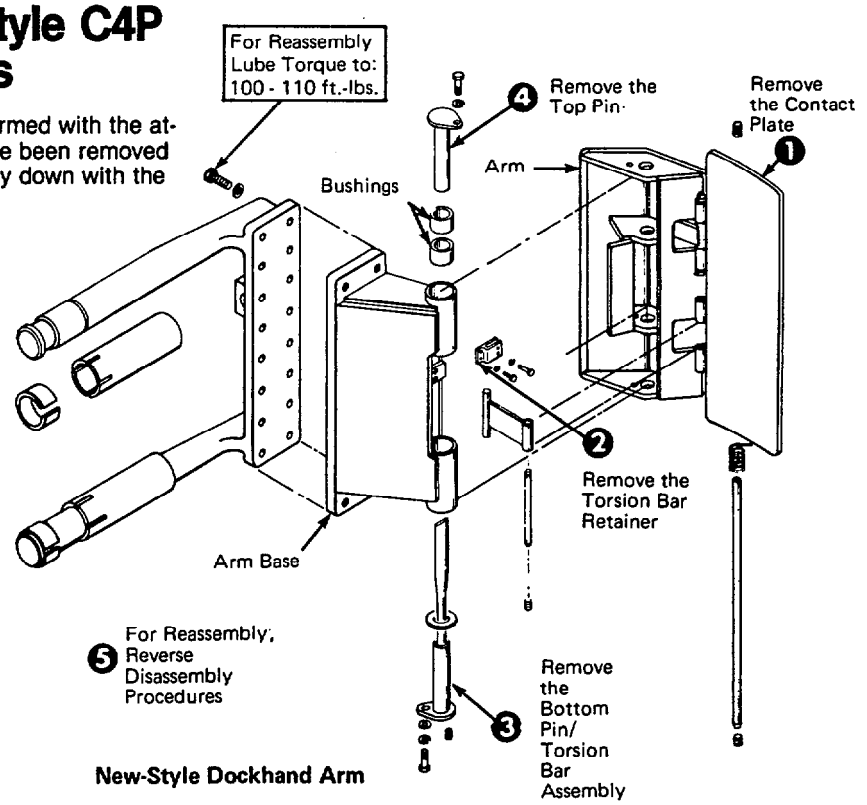
5.2-7 Arm Disassembly and Reassembly, New-style C4P and C4S Dockhands

The following procedures can be performed with the attachment on the truck. If the arms have been removed (Paragraph 5.2-1), lay the arm assembly down with the arm vertical.

1. Remove the contact plate as described in Paragraph 5.2-2.

> **WARNING:** Secure the arm with a suitable overhead hoist and chain.

2. Remove the torsion bar retainer from the arm pivot joint.
3. Remove the bottom pin/torsion bar assembly.
4. Remove the top pivot pin and separate the arm from the arm base.
5. For reassembly, reverse the above procedures.


For Reassembly Lube Torque to: 100 - 110 ft.-lbs.
Remove the Top Pin
Remove the Contact Plate
Arm
Bushings
Remove the Torsion Bar Retainer
Arm Base
For Reassembly, Reverse Disassembly Procedures
Remove the Bottom Pin/ Torsion Bar Assembly

New-Style Dockhand Arm

5.2-8 T-bar Arm Base/Arm Carrier Disassembly and Reassembly

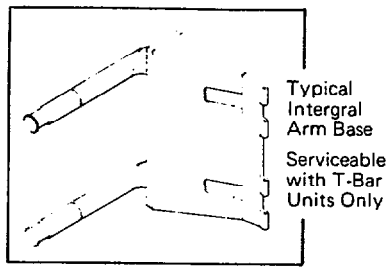
Your attachment may be equipped with either integral arm bases or T-bar arm carriers. Integral arm bases cannot be disassembled.

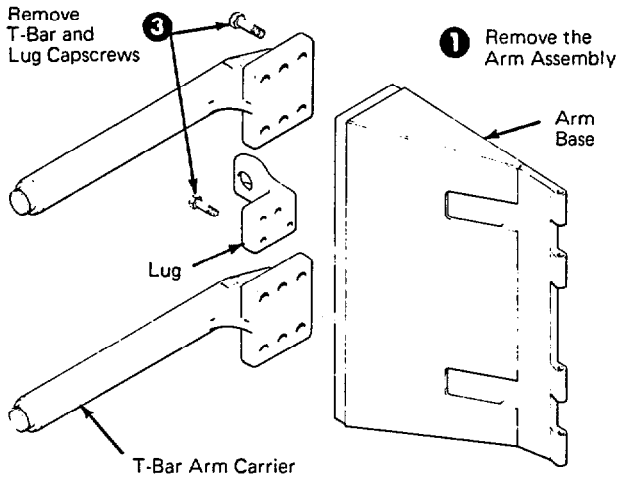
NOTE: Service replacement parts for all integral arm bases are T-bar units which are interchangeable on your attachment frame. Kits are available to convert integral arm bases to the T-bar configuration. Consult the appropriate Cascade Parts Manual pages, or contact Cascade Customer Service.

To disassemble a T-bar arm base/arm carrier assembly:

1. Remove and disassemble the arm as described in the paragraph that applies to your attachment (5.2-1, 5.2-2, 5.2-3, 5.2-4, 5.2-5, 5.2-6, or 5.2-7).
2. Secure the arm base with a suitable overhead hoist and chain.
3. Remove the two T-bars and the cylinder anchor lug by removing the retaining capscrews.
4. For reassembly, reverse the above procedures.

Capscrew Size	Torque To .
5/8 in	120 ft.-lb.
3/4 in	205 ft.-lb.
1 in	440 ft.-lb.

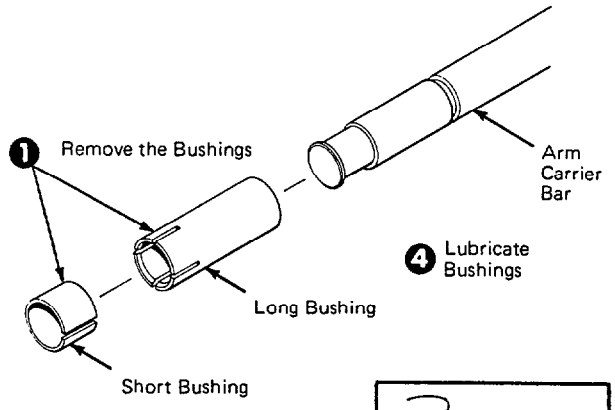


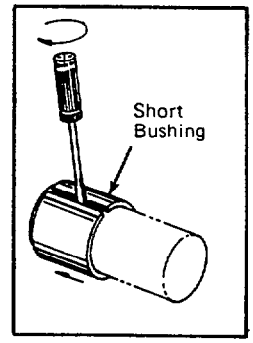


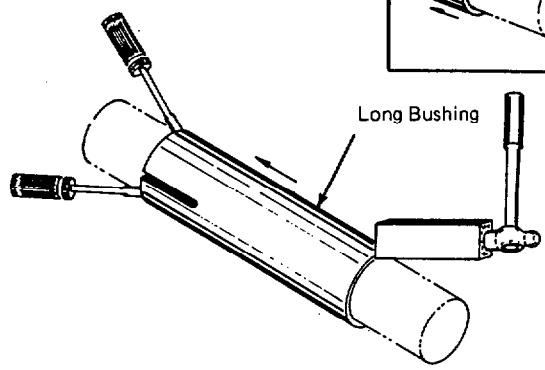
5.2-9 Sliding Arm Bushing Replacement, Two-piece Style

NOTE: An attachment with two-piece bushings may be converted to the new style, one-piece configuration by the installation of the appropriate One-Piece Bushing Conversion Kit. Contact Cascade Customer Service for information.

1. Remove and discard the old long and short bushings. To ease removal, spread the short bushing by inserting a screwdriver blade into the bushing slot. Similarly, insert two screwdrivers into two opposing slots in the long bushing to disengage the bushing retaining lip. It may be necessary to drive off the long bushing with a block and a hammer.
2. Install the long bushing. Spread the slots of the bushing with screwdrivers as during removal. If the bushing will not go over the arm carrier bar, heat it in boiling water for 3 or 4 minutes to soften it. Make sure the bushing retaining lip engages the groove in the arm carrier bar.
3. Install the short bushing. Spread the bushing to ease installation. Make sure the bushing fits into the outermost groove in the arm carrier bar.
4. Lubricate the bushings before assembling arm carriers onto the attachment.

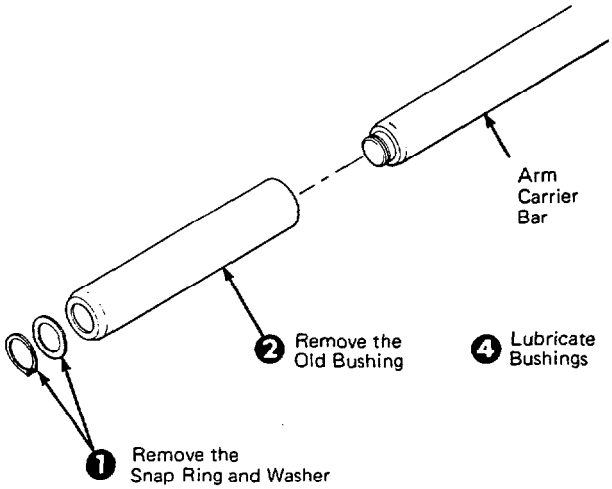






5.2-10 Sliding Arm Bushing Replacement, One-piece Style

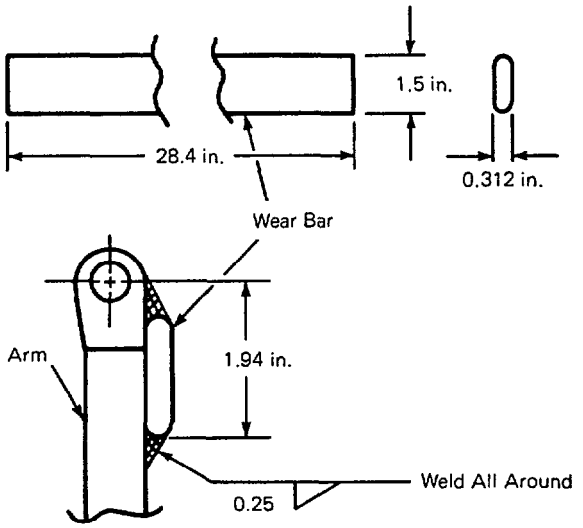
1. Remove the bushing retainer snap ring and washer from the end of the arm carrier bar.
2. Slide off the old bushing.
3. Slide the new bushing on and install the washer and retaining snap ring.
4. Lubricate the bushings before assembling arm carriers onto the attachment.



5.2-11 Wear Bar Installation

Inspect the short arm tip for wear. It frequently wears excessively when the arm is dragged across the floor. To reduce arm tip damage, install a wear bar as follows.

1. Order a wear bar (Cascade part number C-636736) or make a wear bar from AISI 5160 HR (hot-rolled steel). Cut the bar to match the width of the arm.
2. Weld the wear bar to the arm tip as shown. Use E7018 welding rod; pre-heat to 350°F, post-heat to 900°F.
3. Make sure the welds are smooth to avoid paper roll damage during handling in close stacks.
4. Since the wear bar installation makes the arm slightly thicker, make sure the operator knows so he can compensate.



5.3 Cylinders, General Procedures

5.3-1 Cylinder Removal and Installation

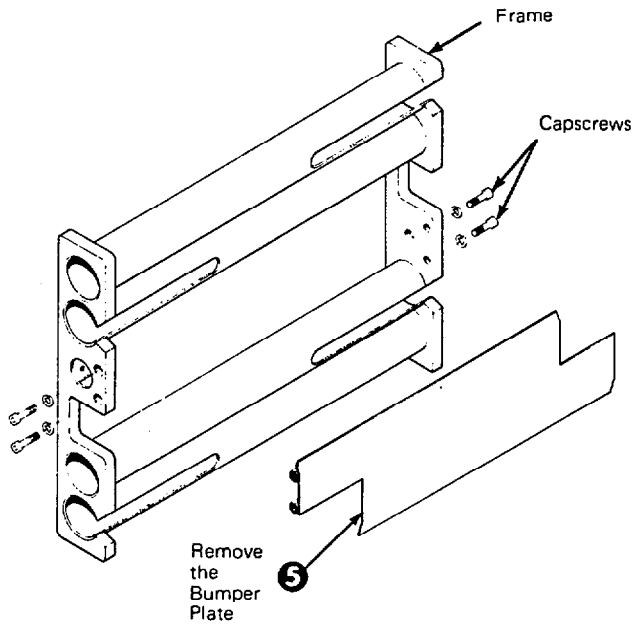
1. Rotate the attachment so the arms are positioned side-by-side (for vertical roll handling).
2. Extend the arms past the width of the frame.
3. Remove the cylinder rod anchor nuts.

   IMPORTANT: Refer to the procedures pertaining to cylinder anchor nuts as described in Paragraph 5.2-1, Step 2.
4. Retract the cylinder rods until they come out of engagement with the arm lugs.
5. Remove the bumper plate.

> **WARNING:** Before removing any hoses, relieve pressure that might be present in the hydraulic system. With the truck off, open the truck auxiliary valve several times in both directions.

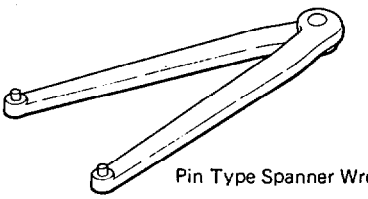
6. Remove and tag the hoses to the cylinders. Cap the hoses and the cylinder ports.
7. Remove the cylinder shell anchor nuts (Paragraph 5.2-1, Step 2).
8. Lift the cylinders away from the clamp frame.
9. Installation is a reverse of removal.

   IMPORTANT: Refer to the procedures pertaining to anchor nuts, Paragraph 5.2-1, Step 7.
10. Operate the attachment through several full cycles to force air in the system to the truck hydraulic tank. Check for leaks.



5.3-2 Cylinder Disassembly

- Use a pin spanner wrench to remove the threaded washer that secures the retainer in the cylinder shell.
- When servicing a cylinder, clamp it in a soft-jawed vise. Clamp the cylinder and the rod on the major diameter at the extreme end only. **Never clamp the cylinder rod sealing surface.**
- V-seals will slide off the piston easily. To gain access to the rod seals, remove the self-adjusting brass bushing (if equipped) from the retainer after the retainer has been removed.

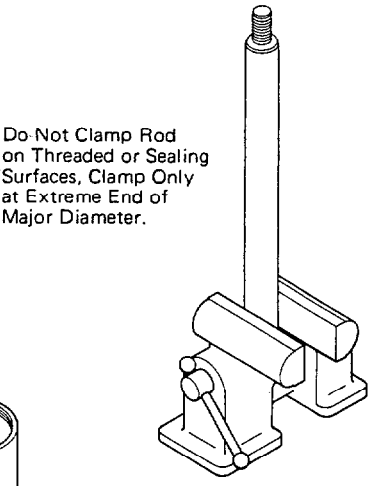


Pin Type Spanner Wrench

5.3-3 Cylinder Inspection

- Inspect the rod, piston, and retainer for nicks or burrs. If deeply gouged, replace the part. Minor nicks and burrs can be removed with an emery cloth.

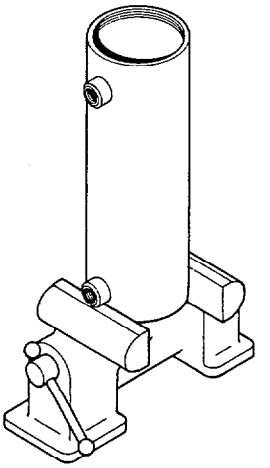
  NOTE: A minor nick is one that will not cause a bypass of oil when the cylinder is operating.
- Inspect the inside of the cylinder shell and remove any minor nicks and burrs (see Note, above) with a butterfly hone. Replace the cylinder shell if it is deeply gouged.
- Inspect the self-adjusting brass bushing that fits inside the retainer (if equipped). If the ID is scored, the bushing should be replaced.



Do Not Clamp Rod on Threaded or Sealing Surfaces, Clamp Only at Extreme End of Major Diameter.

5.3-4 Cylinder Reassembly

- Lubricate all new seals with a mixture of petroleum jelly and hydraulic oil before installing.
- Carefully note the direction of V-seals. If they are installed backwards, the seals will not seal properly. Refer to the illustration of the cylinder you are servicing.
- Always reassemble the rod assembly by sliding the retainer on first, then the piston assembly. Install and torque the piston retaining nut before sliding the rod assembly back into the shell.
- When reassembling a cylinder, always observe all torque values as shown on the appropriate illustration.

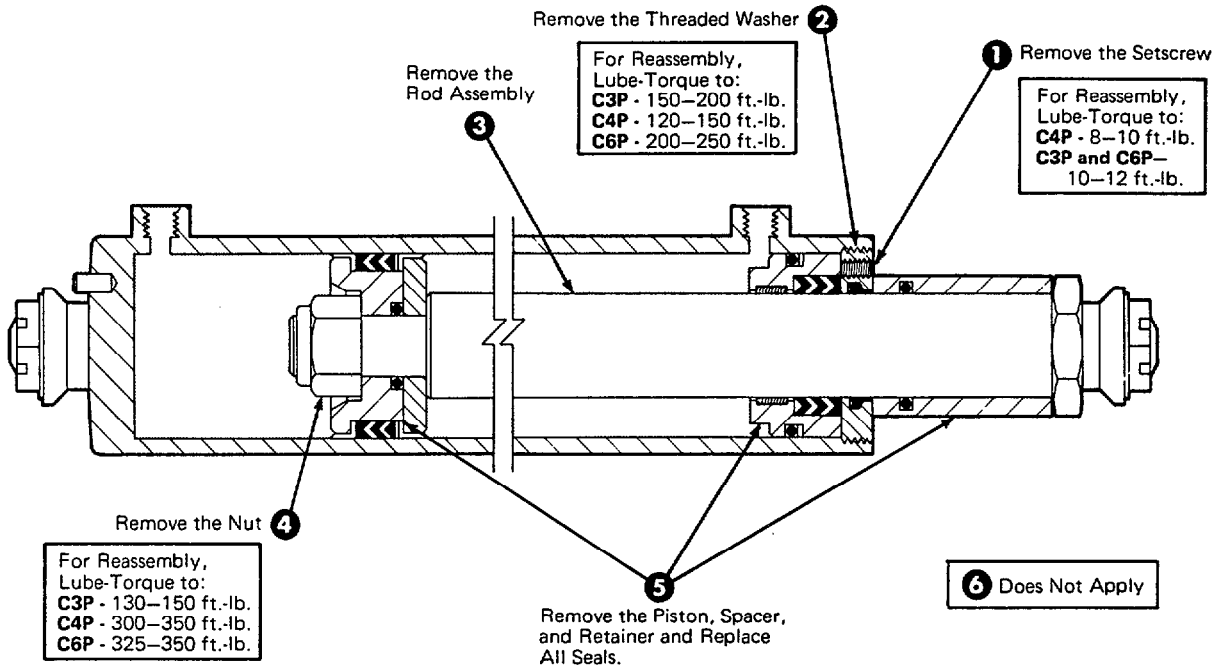


Clamp Shell Only at Extreme Base End.

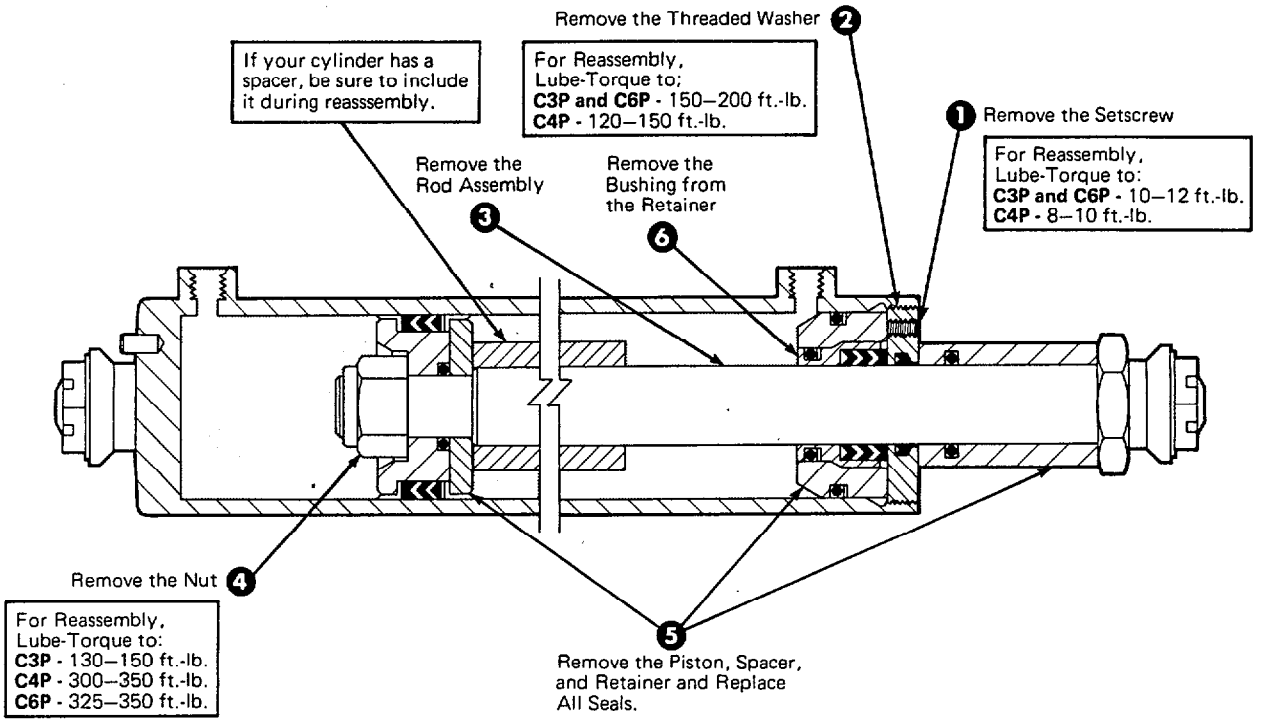
5.4 Cylinder Service

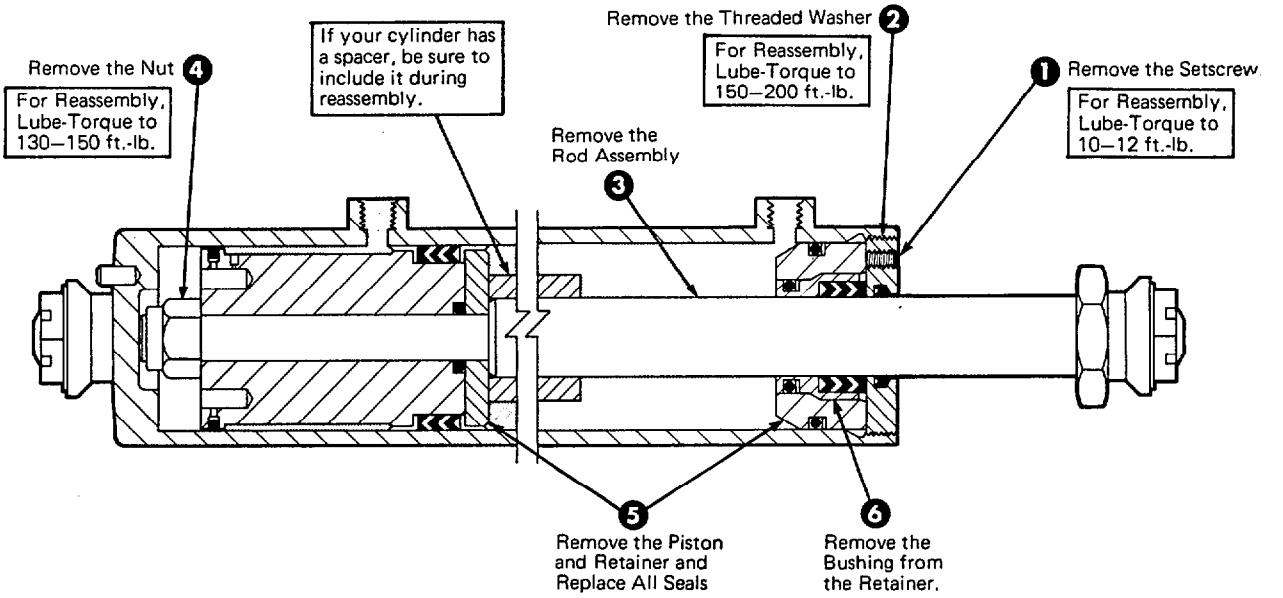
Select the illustration that represents the cylinder you are servicing and perform the following procedures. Read the General Procedures, Paragraph 5.3, before proceeding.

1. Remove the setscrew from the threaded washer.
2. Remove the threaded washer.
3. Pull the rod assembly out of the shell.
4. Remove the nut securing the piston to the rod.
5. Remove the piston, retainer, and spacer (if equipped) and replace all seals.
6. Remove the self-adjusting brass bushing (if equipped) from the retainer to gain access to the rod seal.
7. Reassembly is a reverse of disassembly.


Remove the Threaded Washer 2
For Reassembly, Lube-Torque to:
C3P - 150–200 ft.-lb.
C4P - 120–150 ft.-lb.
C6P - 200–250 ft.-lb.
1 Remove the Setscrew
For Reassembly, Lube-Torque to:
C4P - 8–10 ft.-lb.
C3P and C6P– 10–12 ft.-lb.
Remove the Rod Assembly 3
Remove the Nut 4
For Reassembly, Lube-Torque to:
C3P - 130–150 ft.-lb.
C4P - 300–350 ft.-lb.
C6P - 325–350 ft.-lb.
5 Remove the Piston, Spacer, and Retainer and Replace All Seals.
6 Does Not Apply

5.4 Cylinder Service (Cont.)


Remove the Threaded Washer 2
If your cylinder has a spacer, be sure to include it during reasssembly.
For Reassembly, Lube-Torque to; C3P and C6P - 150–200 ft.-lb. C4P - 120–150 ft.-lb.
1 Remove the Setscrew
For Reassembly, Lube-Torque to: C3P and C6P - 10–12 ft.-lb. C4P - 8–10 ft.-lb.
Remove the Rod Assembly 3
Remove the Bushing from the Retainer 6
Remove the Nut 4
For Reassembly, Lube-Torque to: C3P - 130–150 ft.-lb. C4P - 300–350 ft.-lb. C6P - 325–350 ft.-lb.
5 Remove the Piston, Spacer, and Retainer and Replace All Seals.


Remove the Threaded Washer 2
For Reassembly, Lube-Torque to 150–200 ft.-lb.
If your cylinder has a spacer, be sure to include it during reassembly.
Remove the Nut 4
For Reassembly, Lube-Torque to 130–150 ft.-lb.
1 Remove the Setscrew
For Reassembly, Lube-Torque to 10–12 ft.-lb.
Remove the Rod Assembly 3
5 Remove the Piston and Retainer and Replace All Seals
6 Remove the Bushing from the Retainer.

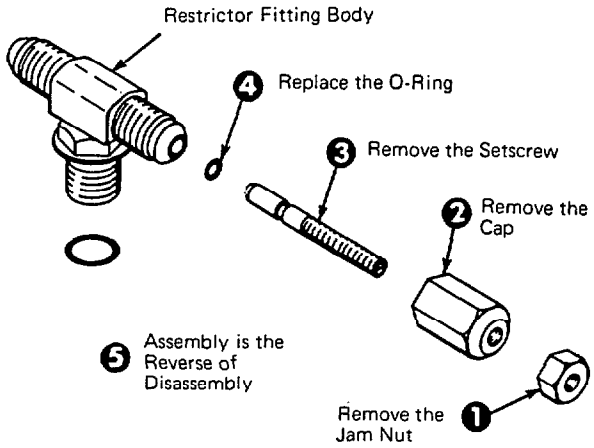
5.5 Restrictor Fittings

An adjustable restrictor fitting is installed in the port of a cylinder to control the flow of hydraulic oil, and, therefore, arm speed.

5.5-1 Restrictor Fitting Service

> **WARNING:** Before disassembling a restrictor fitting, relieve pressure that might be in the hydraulic system. With the truck off, open the truck auxiliary control valves several times in both directions.

1. Remove the jam nut from the setscrew.
2. Remove the cap from the restrictor fitting body.
3. Unthread and remove the setscrew.
4. Replace the O-ring.
5. For assembly, reverse the above procedures. Lubricate the O-ring with STP.


Restrictor Fitting Body
4 Replace the O-Ring
3 Remove the Setscrew
2 Remove the Cap
5 Assembly is the Reverse of Disassembly
Remove the Jam Nut 1

5.5-2 Restrictor Fitting Adjustment

Restrictor fittings should be adjusted so that when one arm bottoms during opening or closing, the other arm is no more than 2 inches from bottoming. Before adjusting, make sure the truck hydraulic system provides the specified volume output as follows:

C3P—10 gpm
C4P, C5P—15 gpm
C6P—20 gpm

To adjust:

1. Loosen the jam nut on each restrictor fitting.
2. Screw both setscrews in until they bottom, then back off two full turns.
3. Operate the attachment to determine which arm is moving slower.
4. Back off the setscrew on the slower arm until arm speed is equalized.
5. Back off both setscrews equally until desired arm speed is achieved without losing equalization.
6. While holding the setscrew with a screwdriver, tighten the jam nuts.

5.6 Revolving Connections

The revolving connection has two cartridge valves located in the valve body except the C5P. The C5P does not have check valves integral with the revolving connection. Instead, there are two separate check valve assemblies mounted near the outside end of the attachment frame. Refer to Paragraph 5.6-5 for service procedures.

The C4S Sideshifting Dockhand does not have a revolving connection. Instead, it has a sideshifting check valve. To service the sideshifting check valve, refer to Paragraph 5.7.

5.6-1 Revolving Connection, Cartridge-type Check Valve Service

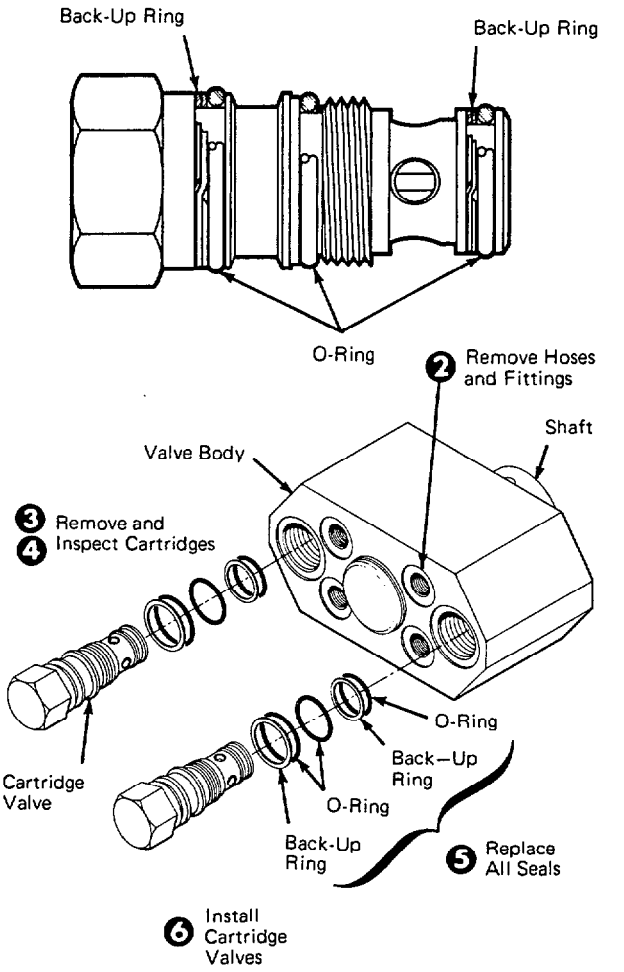
The following procedures can be performed with the attachment on the truck.

1. Remove the cylinders as described in Paragraph 5.3-1.
2. Remove the four supply hoses and fittings from the front of the revolving connection valve body.
3. Remove the two hex-head cartridge valves on the front of the revolving connection. Thoroughly clean the parts.
4. Inspect the cartridge valve assemblies for cut or defective external O-rings.

   NOTE: Internal cartridge valve components are not serviceable.
5. Replace all O-rings and backup rings.

   CAUTION: Backup rings must be wound as shown to avoid seal damage during cartridge installation. O-rings must be installed on the pressure side of the groove.

   IMPORTANT: If leakage is visible between the shaft and valve body, the shaft seals must be replaced. To replace shaft seals, the revolving connection must be removed from the attachment. Refer to the procedures in Paragraphs 5.6-2 and 5.6-3.
6. Installation of the cartridge valves is a reversal of removal. Before installing each cartridge, lubricate the O-rings.

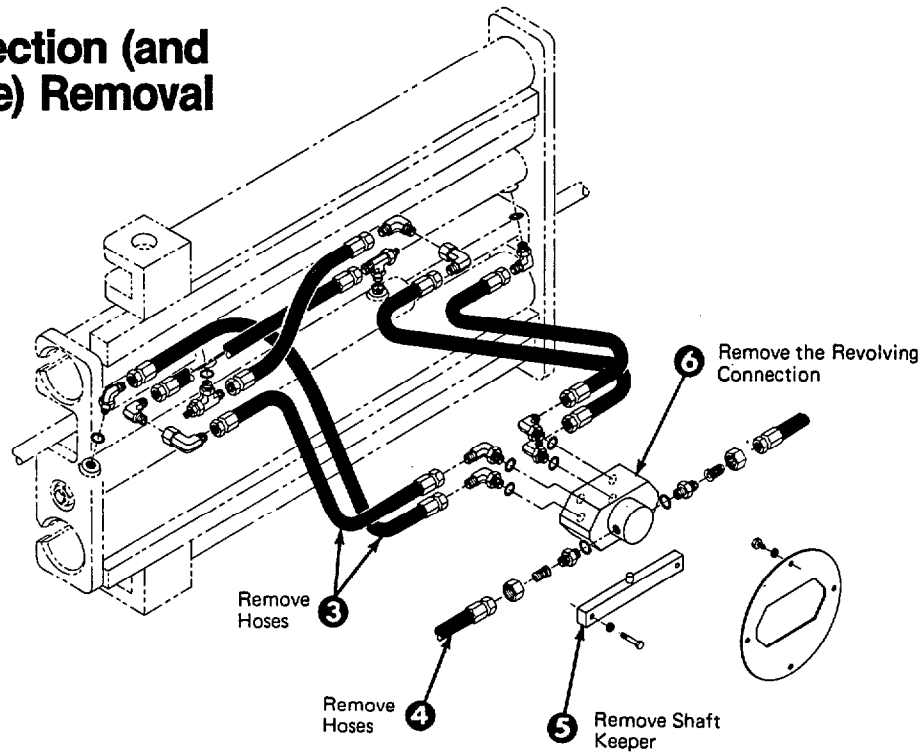


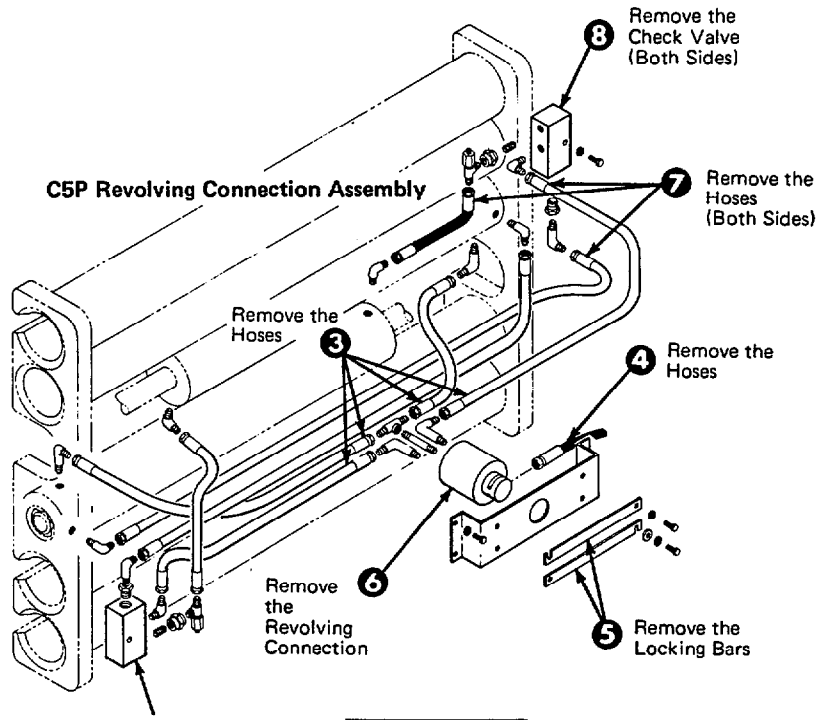
5.6-2 Revolving Connection (and C5P Check Valve) Removal and Installation

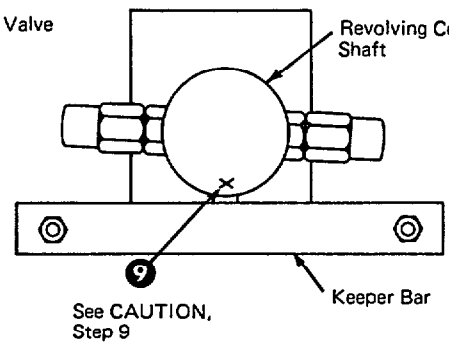
To service the check valves on ball-and-plunger-type revolving connections or to service the revolving connection shaft, the revolving connection must be removed from the attachment.

1. Remove the attachment from the truck as described in Paragraph 5.1.
2. Remove the cylinders as described in Paragraph 5.3-1.
3. Remove, cap, and tag the cylinder supply hoses from the revolving connection valve body.
4. Remove, cap, and tag the truck hoses to the revolving connection shaft, extending out the back of the attachment.
5. Remove the shaft keeper bar (two locking bars on a C5P).
6. Pull the revolving connection out of the attachment.
7. C5P CLAMPS ONLY. To remove the two check valve assemblies, remove, cap, and tag the hoses to each check valve.
8. Remove the single retaining capscrew securing each check valve to the attachment frame.
9. Installation of the revolving connection is a reversal of removal.

   CAUTION: ALL REVOLVING CONNECTIONS EXCEPT C5P The shaft location hole marked "X" must be engaged by the horizontal keeper bar.
10. Install the attachment onto the truck as described in Section 2.




C5P Revolving Connection Assembly
8 Remove the Check Valve (Both Sides)
7 Remove the Hoses (Both Sides)
Remove the Hoses 3
4 Remove the Hoses
6 Remove the Revolving Connection
5 Remove the Locking Bars
Check Valve



5.6-3 Revolving Connection Service

IMPORTANT: Service the revolving connection in a clean work area.

1. Remove the snap ring(s) from the revolving connection shaft.
2. Remove the shaft from the body. On C5P revolving connections, also remove and inspect the shaft bearing.

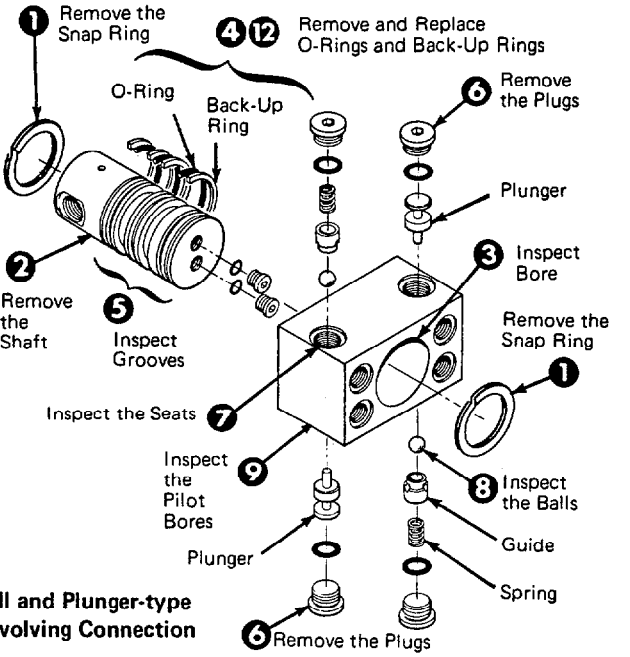
   CAUTION: Remove any paint or burrs from the shaft end and snap ring groove(s) before pulling the shaft out of the valve body to prevent damage to the valve.
3. Clean the parts and inspect the shaft bore for scoring. If the bore is scored, the valve body must be replaced.
4. Note the position of the O-rings and backup rings, then remove them from the valve shaft. Be careful not to scratch the grooves.
5. Check the shaft grooves for rough edges or scratches. Remove minor imperfections with fine emery cloth. If the scratches cannot be removed, replace the shaft.

   NOTE: A minor imperfection is one that will not cause a bypass of oil when the revolving connection is operating.
6. Service cartridge-type check valves as described in Paragraph 5.6-1. To service ball-and-plunger-type check valves, remove the plugs or hose fittings securing the ball checks and the plungers. Remove the balls, springs, guides, and plungers. Thoroughly clean the parts.
7. Inspect the valve seats for scoring or elongation. The valve seats can be reseated by tapping a ball into its seat with a brass punch. If the seat cannot be reseated, the valve must be replaced.
8. Inspect the balls for nicks and scratches.
9. Inspect the pilot bores. They should be smooth and free of scoring. If you cannot smooth minor irregularities with an emery cloth, replace the valve.
10. With the ball and seat **only** in place, attach a hose from the truck junction block to each ball port to test for leakage.

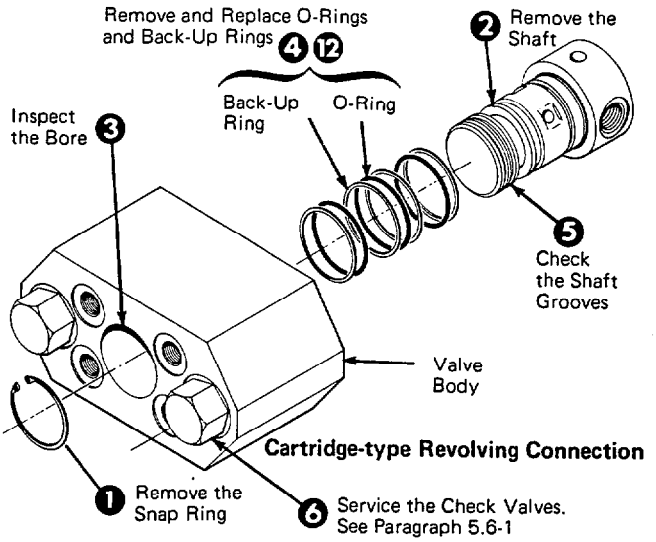
> **WARNING:** Examine the pilot bores with a mirror to avoid the possibility of getting oil in the face.

11. Pressurize the line and examine each pilot bore for leakage. If there is no leakage, reassemble the check valves. If leakage is present, remove the hose and reseat the balls by tapping them into their seats with a brass punch. Retest. If the balls cannot be reseated, the valve must be replaced.
12. Install new O-rings and backup rings on the revolving connection shaft. Be careful not to distort the seals.
13. Reassembly of the revolving connection is a reversal of disassembly. Apply STP to the shaft O-rings to ease reassembly. Rotate the shaft into the body to prevent "rolling" the O-ring seals. Be careful not to damage the valve bore.

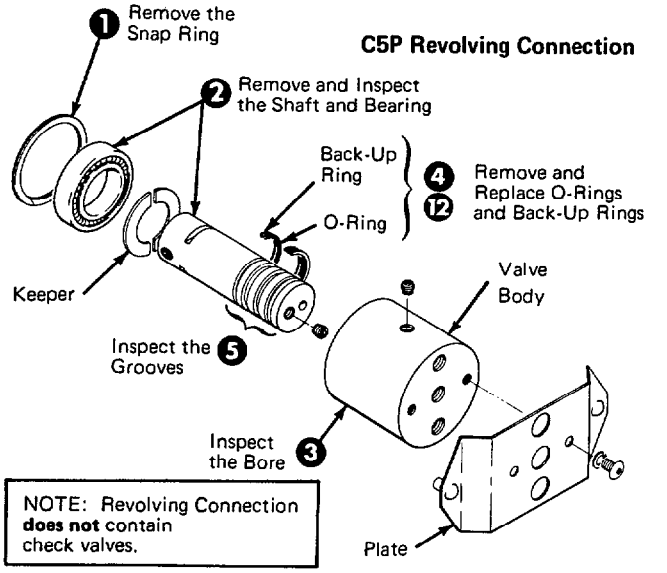
    NOTE: Ball-and-plunger-type revolving connection valve bodies and shafts are not available as replacement parts. They must be replaced by cartridge-type revolving connections, which are interchangeable with ball-and-plunger types.



Ball and Plunger-type Revolving Connection


Remove and Replace O-Rings and Back-Up Rings 4 12
2 Remove the Shaft
Back-Up Ring
O-Ring
Inspect the Bore 3
5 Check the Shaft Grooves
Valve Body
1 Remove the Snap Ring
6 Service the Check Valves. See Paragraph 5.6-1

Cartridge-type Revolving Connection

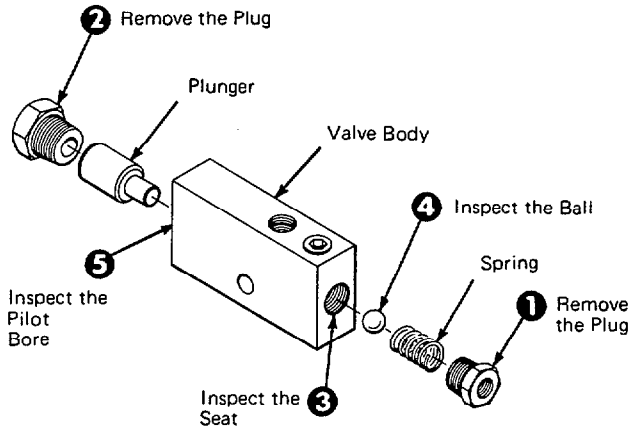


C5P Revolving Connection

NOTE: Revolving Connection **does not** contain check valves.

5.6-4 Check Valve Service, C5P Clamps Only

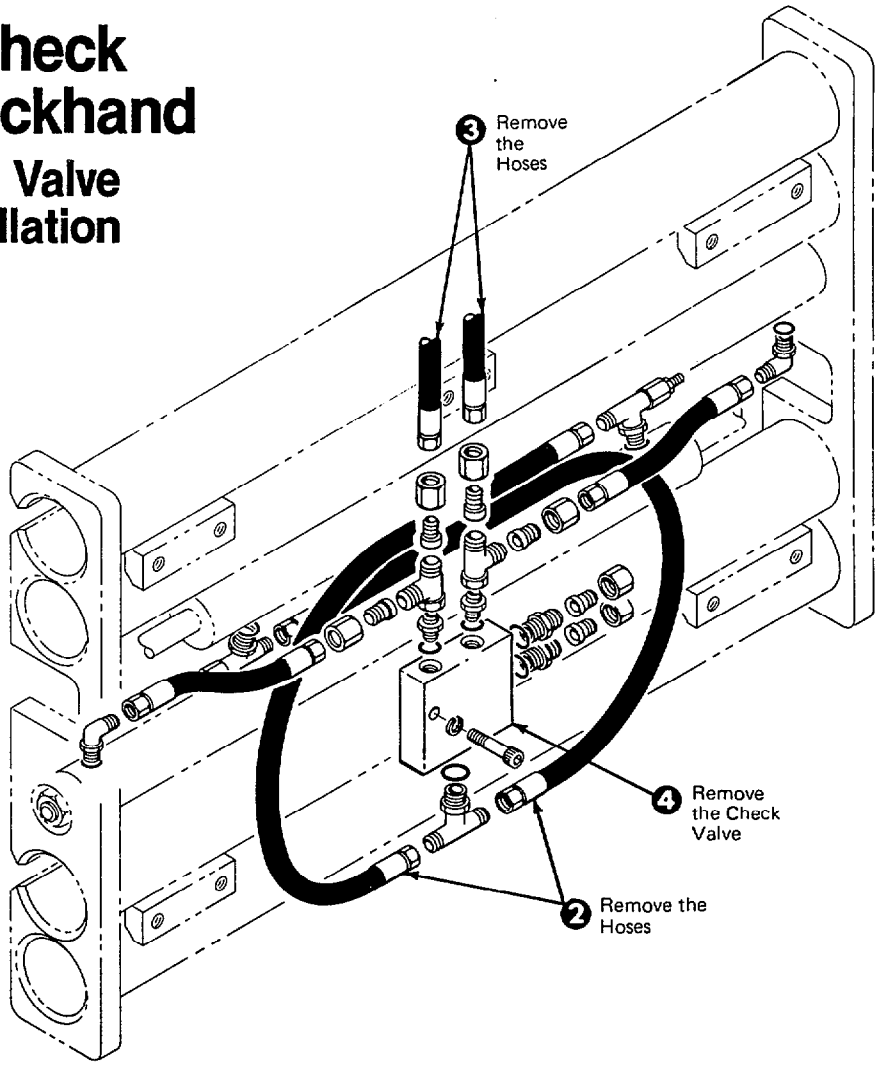
1. Remove the plug securing the ball check and spring.
2. Remove the plug securing the plunger.
3. Inspect the valve seat for scoring or elongation. The valve seat can be reseated by tapping the ball into its seat with a brass punch. If the seat cannot be reseated, the valve body must be replaced.
4. Inspect the ball for nicks and scratches.
5. Inspect the pilot bore. It should be smooth and free of scoring. If you cannot remove minor irregularities with an emery cloth, replace the valve body.
6. Reassembly of the check valve is a reversal of disassembly.



5.7 Sideshifting Check Valve, C4S Dockhand

5.7-1 Sideshifting Check Valve Removal and Installation

1. Remove the attachment from the truck as described in Paragraph 5.1.
2. Remove, cap, and tag the cylinder supply hoses from the check valve.
3. Remove, cap, and tag the truck hoses to the check valve.
4. Remove the check valve by removing the capscrew securing the valve to the attachment frame.
5. Installation of the check valve is a reversal of removal.
6. Install the attachment onto the truck as described in Section 2.



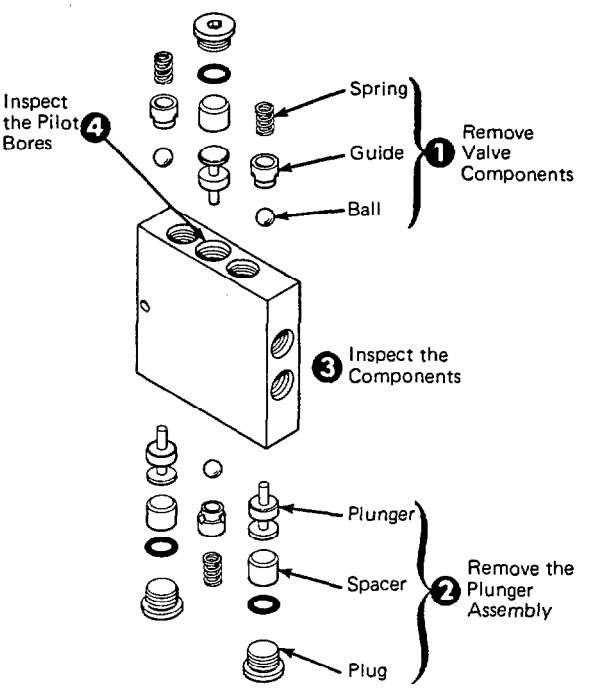
5.7-2 Sideshifting Check Valve Service

IMPORTANT: Service the check valve in a clean work area.

1. Remove the hose fittings from the valve body and remove the balls, guides, and springs. Clean the parts.
2. Remove the allen-head plugs and remove the plungers and spacers. Clean the parts.
3. Inspect all parts. Worn guides and plungers, weak or broken springs, and nicked balls should be replaced.
4. Inspect the pilot bores. They should be smooth and free of scoring.
5. With the ball and seat **only** in place, attach a hose from the truck junction block to each ball port and test for leakage.

> **WARNING:** Examine the pilot bores with a mirror to avoid the possibility of getting oil in the face.

6. Pressurize the line and examine each pilot bore for leakage. If there is no leakage, reassemble the check valve. If leakage is present, remove the hose and reseat the balls by tapping them into their seats with a brass punch. Retest. If the balls cannot be reseated, the valve must be replaced.
7. Reassembly of the sideshifting check valve is a reversal of disassembly.



5.8 Rotator Drive Group

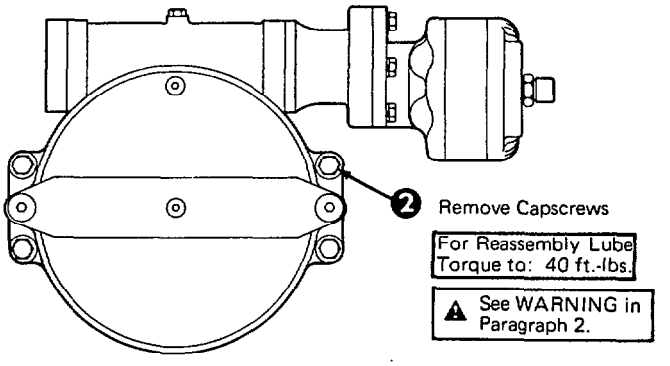
Your attachment may be equipped with either a cushioned rotator drive group or an uncushioned unit. Cushioning is achieved by the installation of cone-shaped spring washers on both sides of the worm, powered by the rotator motor. The worm gear is in mesh with the rotator ring gear. Therefore, shock loads applied to the attachment arms are transferred to the worm through the worm gear and are absorbed by the spring washers.

5.8-1 Rotator Drive Group Removal and Installation

1. Remove the attachment from the truck as described in Paragraph 5.1.
2. Remove the rotator gear drive case retaining capscrews and remove the gearcase from the attachment baseplate.

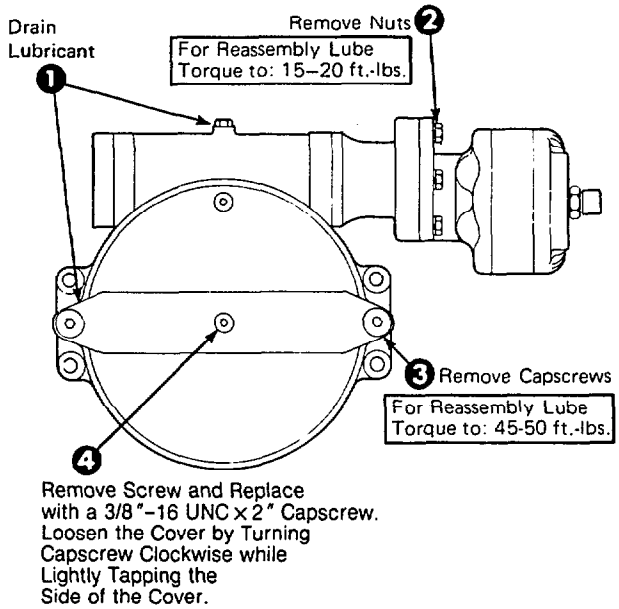
> **WARNING:** With the gearcase removed, the baseplate is free to rotate. Keep clear of the baseplate to avoid being pinched.

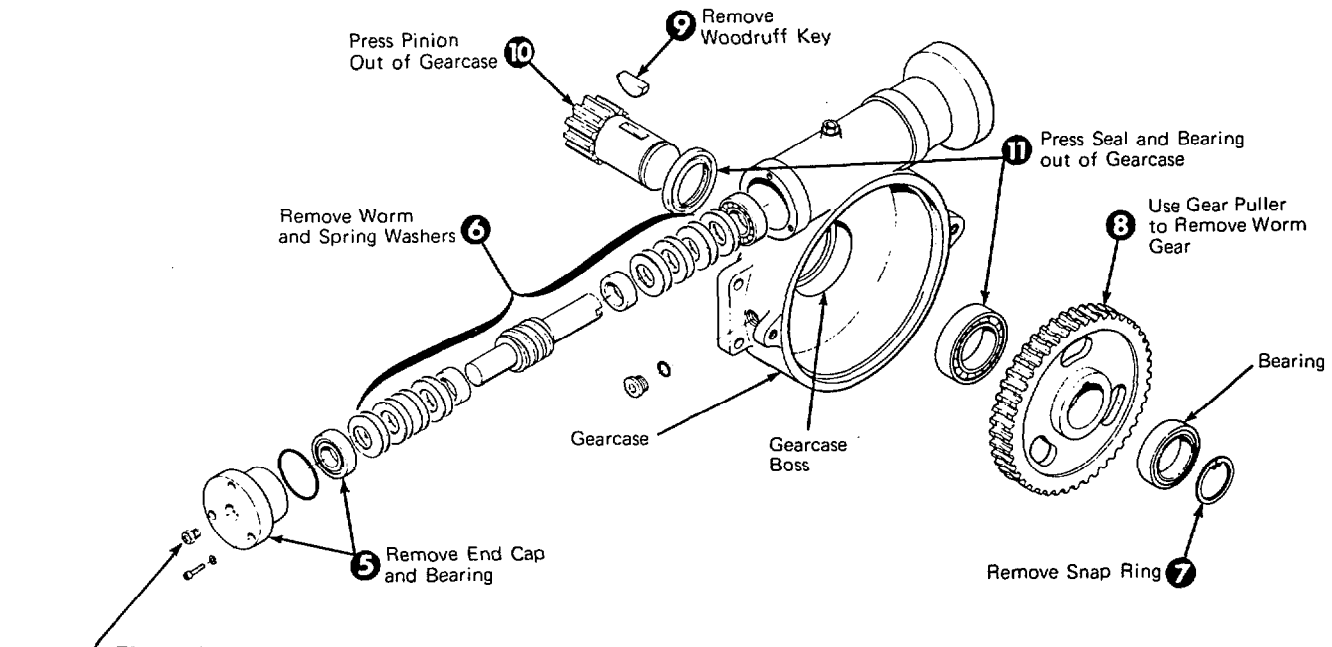
3. Service the rotator drive group as described in Paragraphs 5.8-2 and 5.8-3.
4. Reinstallation of the rotator drive group is a reversal of removal.
5. Install the attachment onto the truck as described in Section 2.



5.8-2 Rotator Drive Group Disassembly and Service

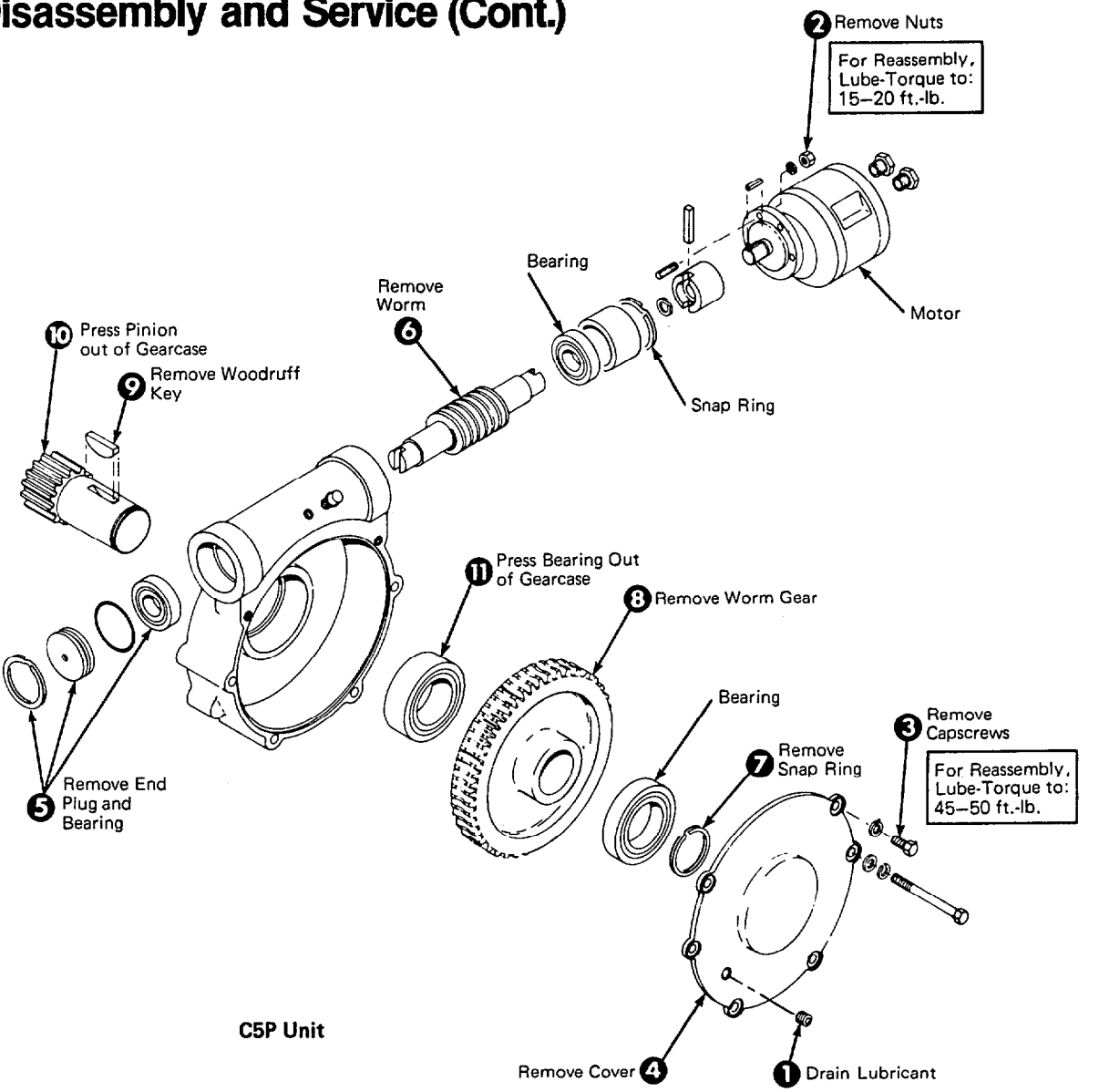
1. Drain the lubricant from the gearcase. Lay the gearcase (pinion down) on 4 X 4's placed on either side of the pinion.
2. Remove the rotator motor as described in Paragraph 5.9-1. Motor service procedures are described in Paragraph 5.9-2.
3. Remove the capscrews retaining the gearcase cover.
4. On all models except the C5P, remove the capscrew from the center of the cover and replace it with a 3/8-inch-16 UNC capscrew 2 inches long. Turn the capscrew clockwise while lightly tapping the side of the cover with a plastic-head hammer to loosen it. C5P clamps do not have the center screw.
5. Remove the end cap and bearing. The end cap is secured by capscrews except the C5P, which is secured by a snap ring and plug.
6. Remove the worm and spring washers (if equipped).
7. Remove the snap ring from the pinion shaft.
8. Using a gear puller, remove the worm gear from the pinion shaft.
9. Remove the Woodruff key from the pinion shaft.
10. Press the pinion out of the gearcase.
11. Press the pinion seal (if equipped) and bearing out of the gearcase.
12. Clean and inspect the components. Replace any item that is worn or galled. Remove any burrs with an emery cloth or small hand grinder.


Drain Lubricant
1
Remove Nuts 2
For Reassembly Lube Torque to: 15–20 ft.-lbs.
3 Remove Capscrews
For Reassembly Lube Torque to: 45-50 ft.-lbs.
4
Remove Screw and Replace with a 3/8"-16 UNC x 2" Capscrew. Loosen the Cover by Turning Capscrew Clockwise while Lightly Tapping the Side of the Cover.


Press Pinion Out of Gearcase 10
9 Remove Woodruff Key
11 Press Seal and Bearing out of Gearcase
Remove Worm and Spring Washers 6
8 Use Gear Puller to Remove Worm Gear
Bearing
Gearcase
Gearcase Boss
5 Remove End Cap and Bearing
Remove Snap Ring 7

CAUTION: Some units will have this style relief fitting in the end cap. These units may have damaged ball thrust bearings due to low rotator fluid. Cascade has a drive box lube kit available which provides new ball thrust bearings and a new pressure relief fitting. See Technical Bulletin 114 for complete ordering instructions.

5.8-2 Rotator Drive Group Disassembly and Service (Cont.)

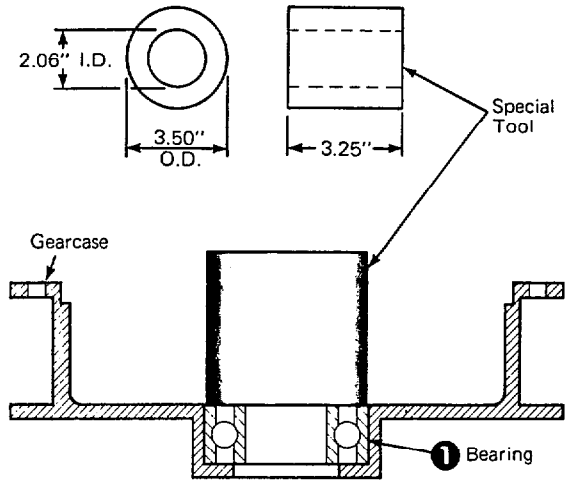


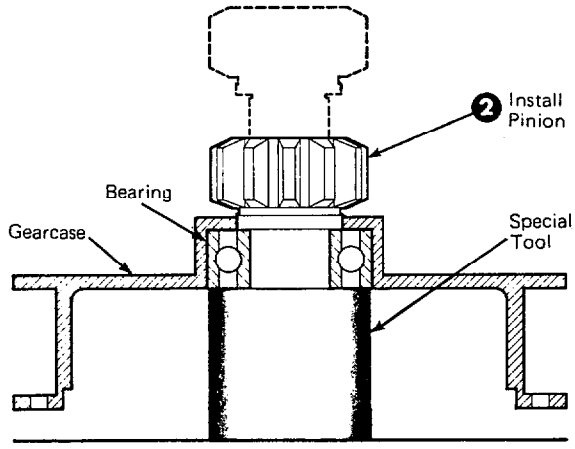
C5P Unit

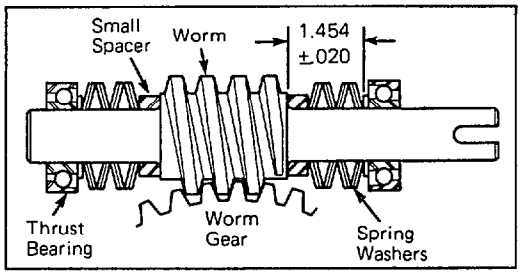
5.8-3 Rotator Drive Group Reassembly

1. Press the bearing into the housing from the inside using the special tool, Cascade part number C-664620. Make sure the bearing is fully seated and flush with the inside of the gearcase.
2. Support the bearing from the inside with the special tool and press the pinion into the bearing from the outside.
3. Install the Woodruff key into the pinion shaft.
4. Press the worm gear onto the pinion shaft, making sure you align it with the Woodruff key.
5. Press the bearing onto the pinion shaft.
6. Install the snap ring.
7. Assemble the spring washers, spacers (if equipped), and ball thrust bearings (See Caution below) on the worm shaft and install in the housing.

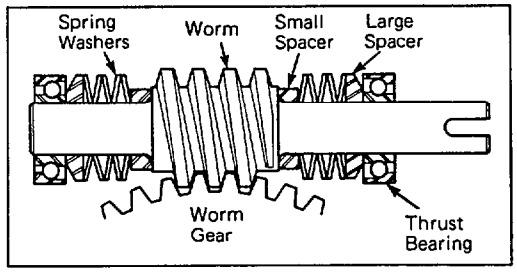
   CAUTION: The ball thrust bearing must be assembled on the worm with the thickest portion of the outer race (the side stamped with the manufacturer and part number) facing away from the washers.



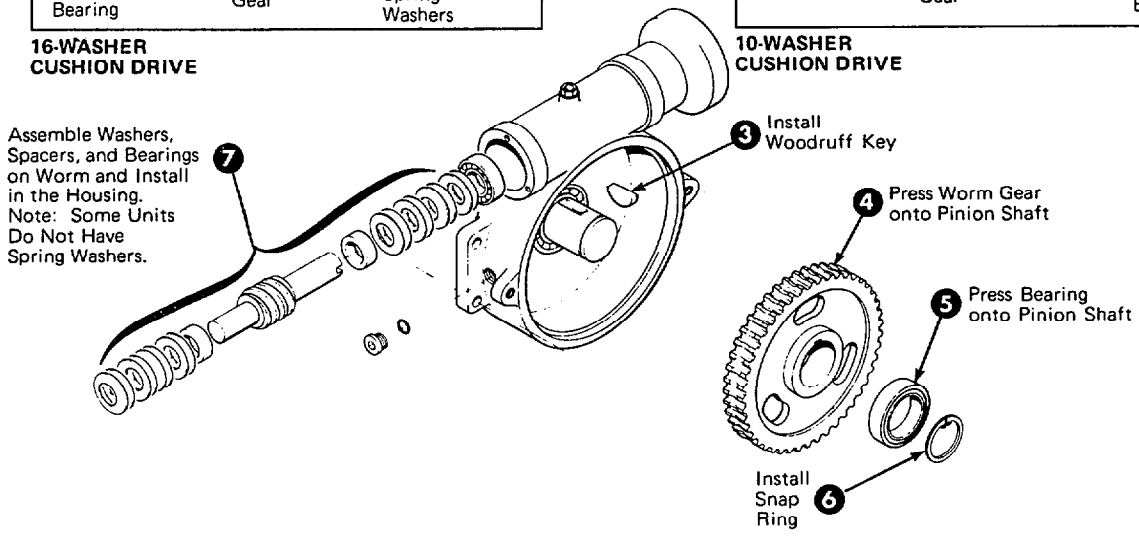




16-WASHER CUSHION DRIVE

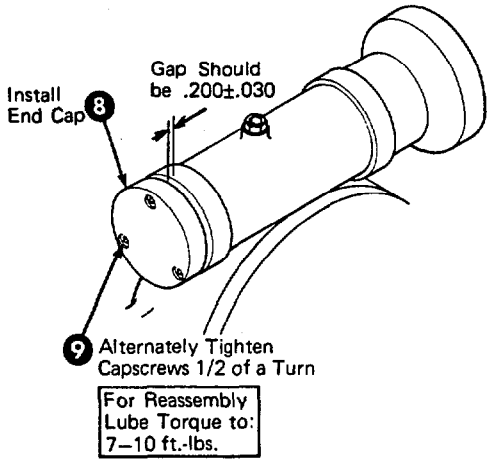


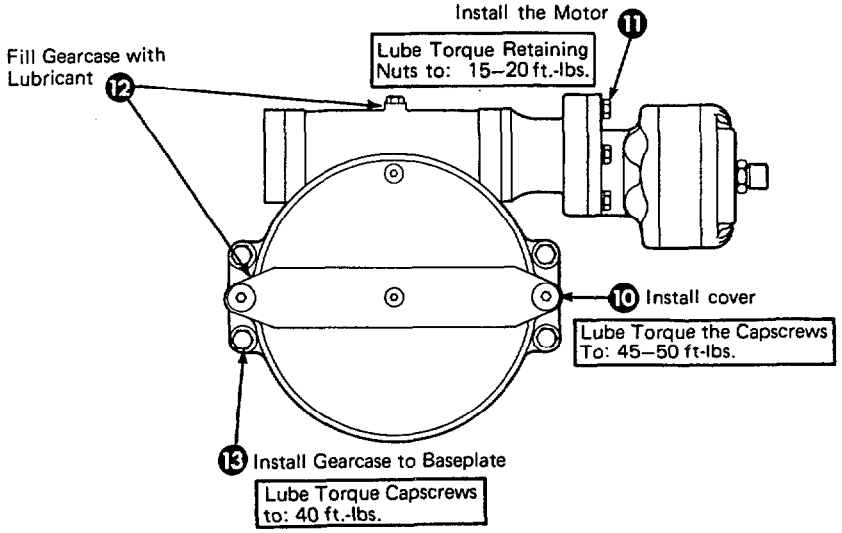
10-WASHER CUSHION DRIVE


Assemble Washers, Spacers, and Bearings on Worm and Install in the Housing. Note: Some Units Do Not Have Spring Washers.
7
3 Install Woodruff Key
4 Press Worm Gear onto Pinion Shaft
5 Press Bearing onto Pinion Shaft
Install Snap Ring
6

5.8-3 Rotator Drive Group Reassembly (Cont.)

8. Install the end cap. If the gap on cushion drive units is greater than that shown, the spring washers are incorrectly stacked. Remove the worm and restack the washers.
9. Alternately tighten the endcap capscrews 1/2 of a turn. Lube torque the capscrews to 7-10 ft.-lbs. On C5P units, install the plug and snap ring.
10. Install the cover.
11. Install the motor.
12. Fill the gearcase with 44 fluid ounces of Cascade Rotator Fluid (Cascade part number C-656300). NOTE: C-656300 = 32 fluid ounces.
13. Install the gearcase onto the attachment baseplate.


Install End Cap 8
Gap Should be .200±.030
9 Alternately Tighten Capscrews 1/2 of a Turn
For Reassembly Lube Torque to: 7–10 ft.-lbs.


Install the Motor 11
Lube Torque Retaining Nuts to: 15–20 ft.-lbs.
Fill Gearcase with Lubricant 12
10 Install cover
Lube Torque the Capscrews To: 45–50 ft-lbs.
13 Install Gearcase to Baseplate
Lube Torque Capscrews to: 40 ft.-lbs.

5.9 Motor

5.9-1 Motor Removal and Installation, Revolving Clamps Only

The rotator motor can be removed for service with the attachment on the truck.

> **WARNING:** Before removing supply hoses, relieve pressure that might be present in the hydraulic system. With the truck off, open the truck auxiliary control valves several times in both directions.

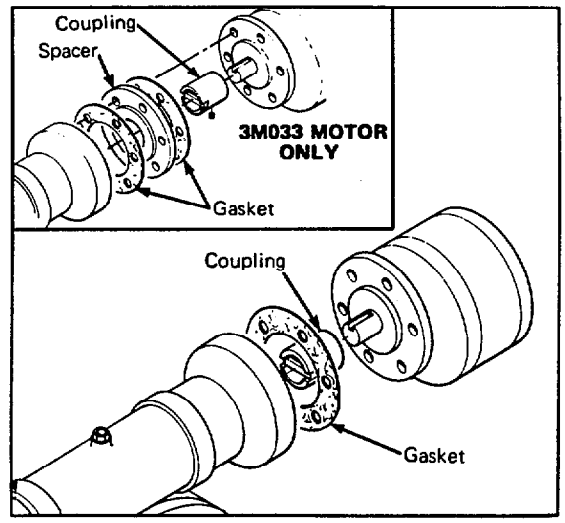
1. Remove, cap, and tag the supply hoses to the motor.
2. Remove the motor from the rotator drive assembly by removing the six retaining nuts. Slide the motor out of engagement and remove the coupling and key from the motor shaft. A small amount of rotator fluid might spill when the motor is removed.
3. Clean the motor and gear case mating surfaces with solvent. Apply LOCTITE 515 sealer to these surfaces.

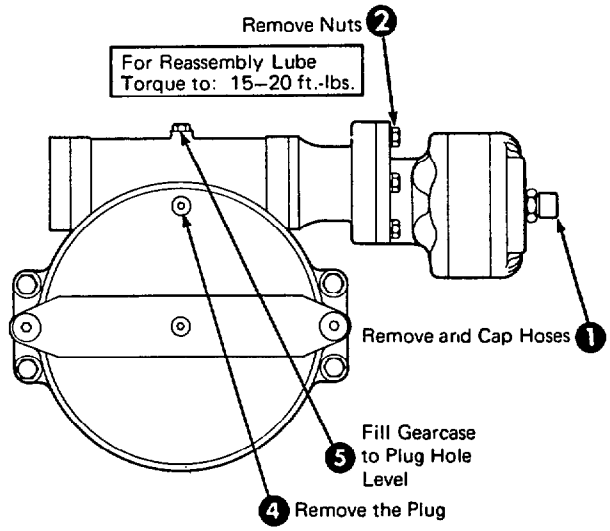
   Install the motor and tighten the retaining nuts to a torque of 15—20 ft.- lbs. (Lubed).

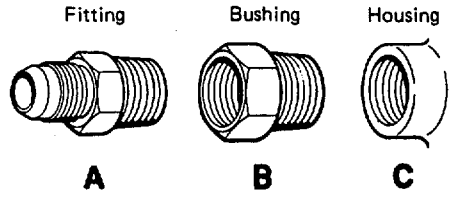
   CAUTION: Because the threaded part on the motor is tapered, overtightening the fitting in the port will split the housing. Fittings should be snug but not overtightened. Install reducers and fittings as follows:

   Thread hose fitting (A) into bushing (B) until tight. Fit the assembly of the bushing and fitting (A + B) into the housing (C). Tighten the bushing (B) **only.** Any attempt to tighten the hose fitting after installation in the bushing may result in a cracked housing.

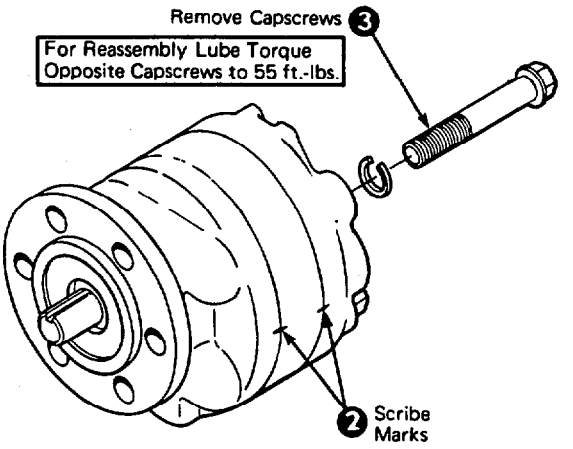
   CAUTION: If rotator fluid was spilled when the motor was removed, perform the following:
4. Remove the plug at the top of the side cover.
5. Fill the gearcase to the plug hole level with Keystone WG-1 lube (Cascade part no. C-656300). Install the plug.




Remove Nuts 2
For Reassembly Lube
Torque to: 15–20 ft.-lbs.
Remove and Cap Hoses 1
5 Fill Gearcase to Plug Hole Level
4 Remove the Plug



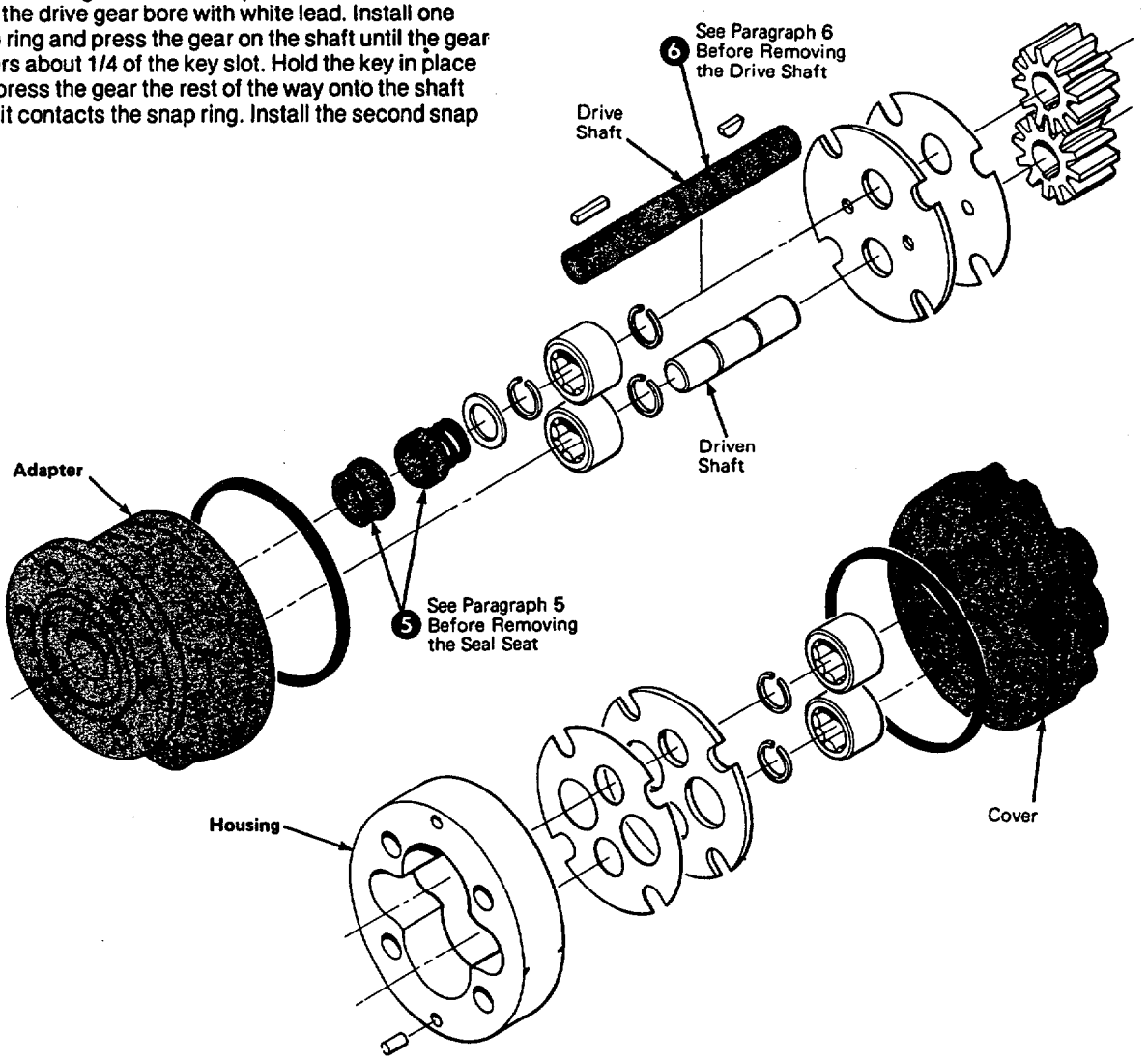
5.9-2 Motor Disassembly and Reassembly



Cascade only services the adapter and cover, the drive shaft and the seal kit which includes the seal seat and seat assembly and the 2 large O-rings. Due to cost, if any other parts need replacement, it is cost effective to replace the complete motor assembly. The instructions below are for replacing the seal kit, drive shaft, adapter and cover only.

IMPORTANT: Service the motor in a clean work area.

1. Clean the outside of the motor and dry thoroughly. Remove any sharp edges or burrs.
2. Mark the sections of the motor with a punch or scribe for matching during reassembly.
3. Remove the four capscrews from the motor cover.
4. With a fibre hammer, tap the cover to loosen and remove it.
5. Inspect the seal seat. Replace only if the sealing face is excessively worn or damaged. Remove it by inverting the adapter and driving out the seat with a wooden block. Press the new seat into the adapter.
6. To replace the drive shaft, remove the snap ring and press off the gear in an arbor press. To reassemble, coat the drive gear bore with white lead. Install one snap ring and press the gear on the shaft until the gear covers about 1/4 of the key slot. Hold the key in place and press the gear the rest of the way onto the shaft until it contacts the snap ring. Install the second snap ring.



Section 5 Service

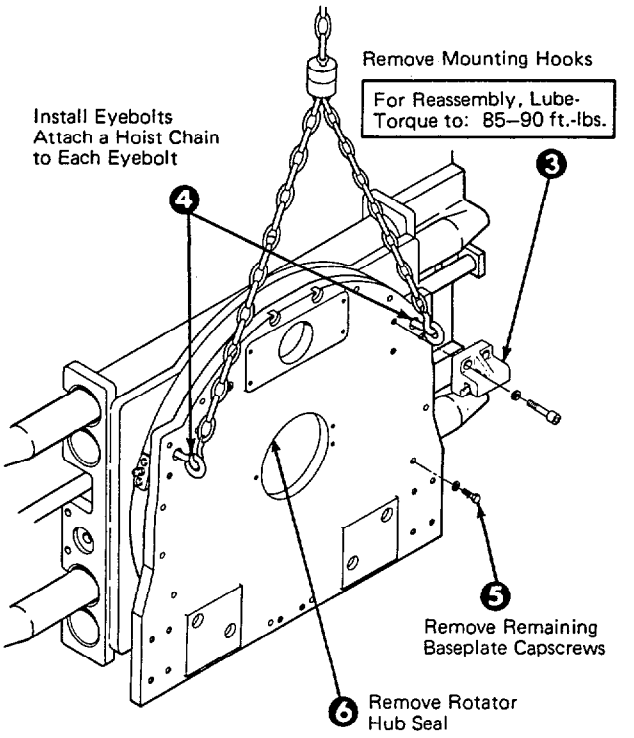
5.10 Frame Assembly, all Models except C5P and C4S Sideshifting Dockhand

5.10-1 Baseplate Removal

1. Remove the attachment as described in Paragraph 5.1.
2. Remove the revolving connection, Paragraph 5.6-2. Remove the rotator drive group, Paragraph 5.8-1.
3. Remove the upper mounting hooks.
4. Remove the two baseplate retaining capscrews closest to each upper mounting hook bolt pattern. Replace the two capscrews with eyebolts. Attach a hoist chain to each eyebolt. Lift the hoist chains to take out the slack.

> **WARNING:** Be sure to attach a hoist chain to each eyebolt before removing the remaining baseplate capscrews. Make sure your overhead crane has a rated capacity of at least 1000 pounds.

5. Remove the remaining baseplate retaining capscrews. Lift off the baseplate.
6. Remove the hub seal from the rotator hub.

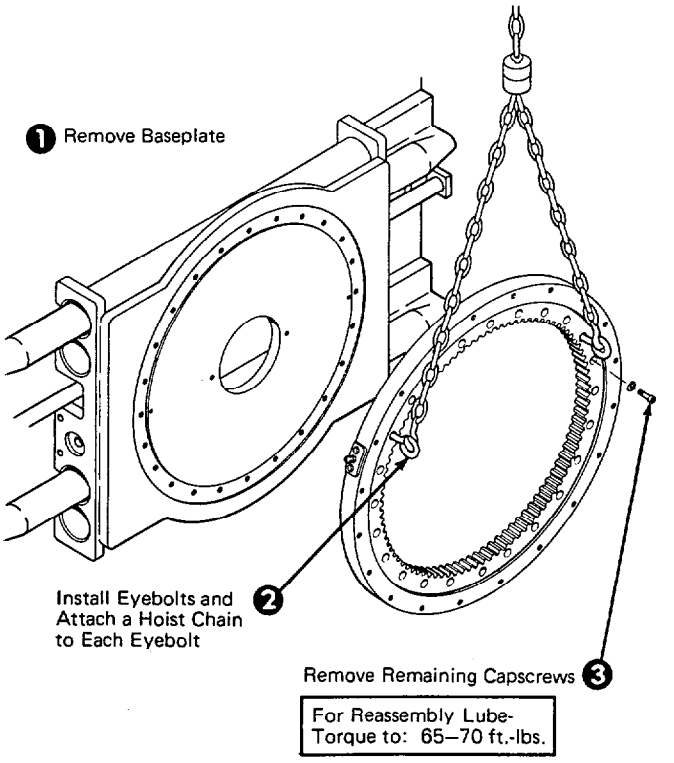


5.10-2 Ring Gear/Bearing Assembly Removal

1. Remove the baseplate assembly as described in Paragraph 5.10-1.
2. Replace two ring gear retaining capscrews with eyebolts. Attach a hoist chain to each eyebolt. Lift the hoist chains to take out the slack.

> **WARNING:** Be sure to attach a hoist chain to each eyebolt before removing the remaining ring gear capscrews. The ring gear is very heavy and oily, so take care to prevent pinching or dropping on fingers or feet. Make sure your overhead crane has a rated capacity of at least 1000 pounds.

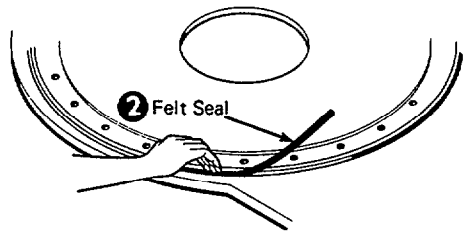
3. Remove the remaining capscrews and lift the ring gear/bearing assembly from the attachment.

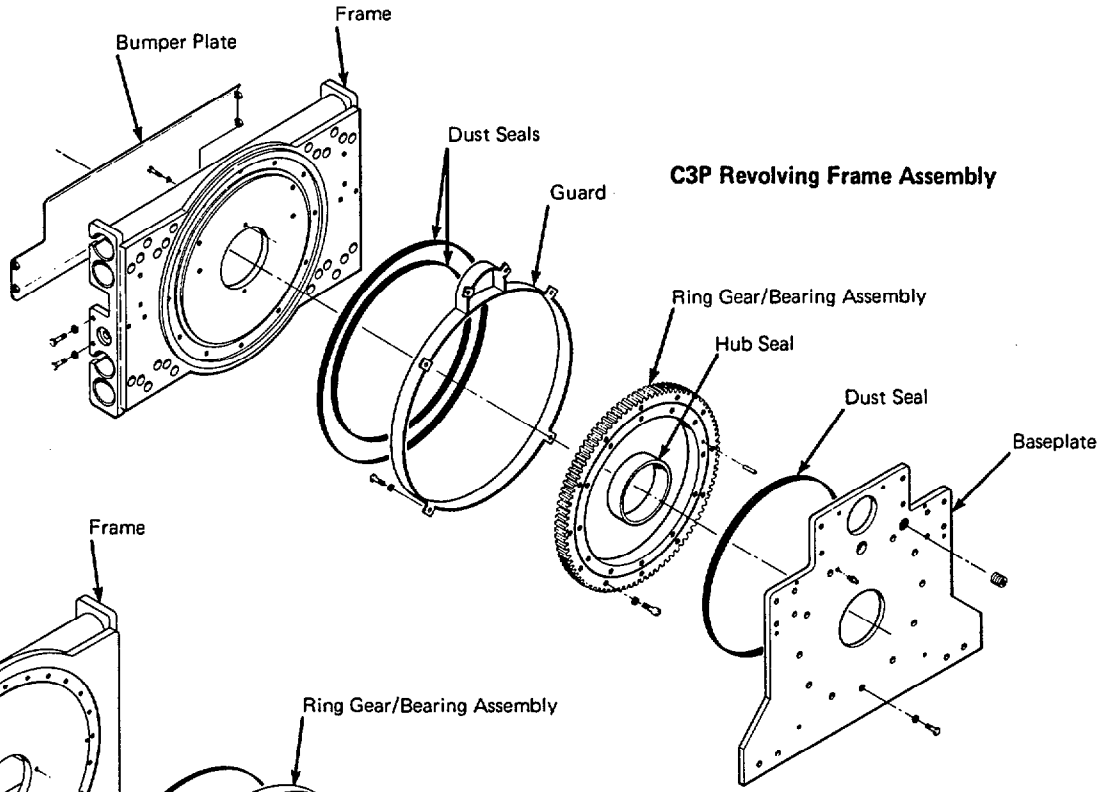

1 Remove Baseplate
Install Eyebolts and Attach a Hoist Chain to Each Eyebolt
2
Remove Remaining Capscrews
3
For Reassembly Lube-Torque to: 65–70 ft.-lbs.

5.10-3 Frame Assembly Service

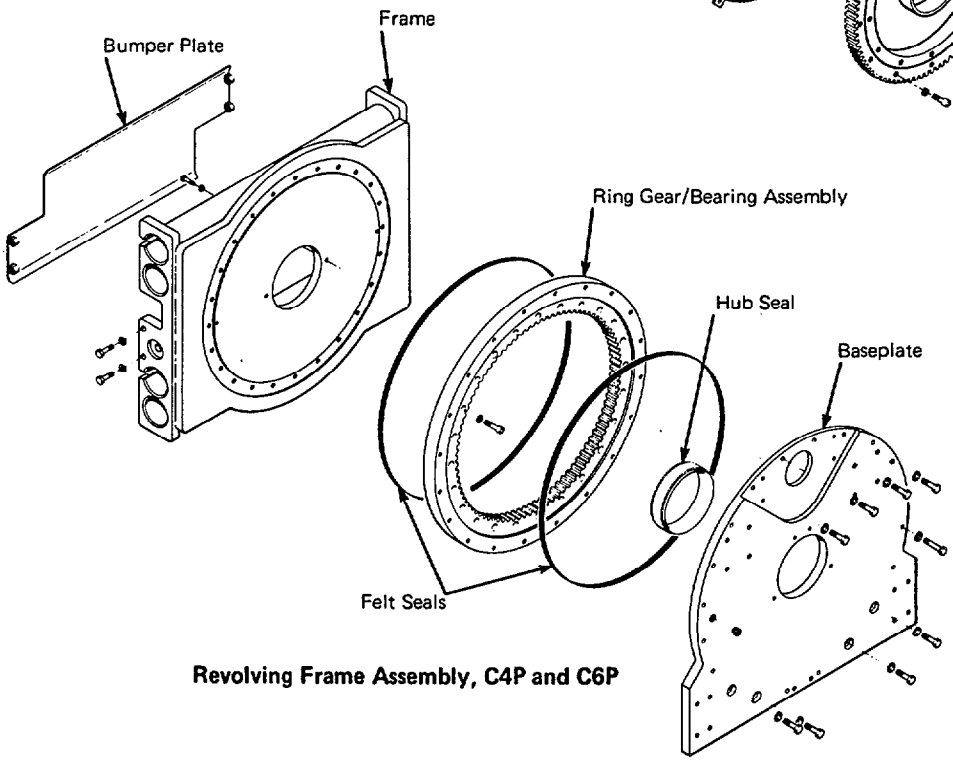
The ring gear and bearing are matched components and must be replaced as an assembly. Whenever the frame assembly is disassembled, the felt seals must be replaced with new ones as follows.

1. Remove the old felt seals and clean the grooves.
2. To install a new seal, start one end of the seal strip in the groove.
3. Push the seal to the bottom of the groove all the way around the groove. If the seal is too short, stretch it evenly around the groove to lengthen it.
4. Cut the two ends of the seal so they meet squarely.
5. Bond the ends of the seal with 3M-brand weatherstrip adhesive No. 8001 or equivalent. After the adhesive dries, lubricate the seal with SAE30 motor oil to swell the seal into the groove.





C3P Revolving Frame Assembly



Revolving Frame Assembly, C4P and C6P

5.10-4 Frame Reassembly

1. Attach the hoist chain to the ring gear eyebolts and lift the ring gear/bearing assembly into position.

   CAUTION: All ring gear/bearing assemblies have a "heat treat overlap" zone. This zone is designated by a stamped letter on the outer ring of the assembly. When installing the ring gear/bearing assembly, the "heat treat overlap" zone must be located in one of the four locations shown.

2. Lube-torque the capscrews to 65-70 ft.-lb. in the order shown.

   NOTE: Some units have fewer than the 24 capscrews shown here. On those units, lube-torque using a similar pattern.

   IMPORTANT: Apply a liberal quantity of NLGI consistency No. 0 grease to the teeth of the ring gear before continued assembly.

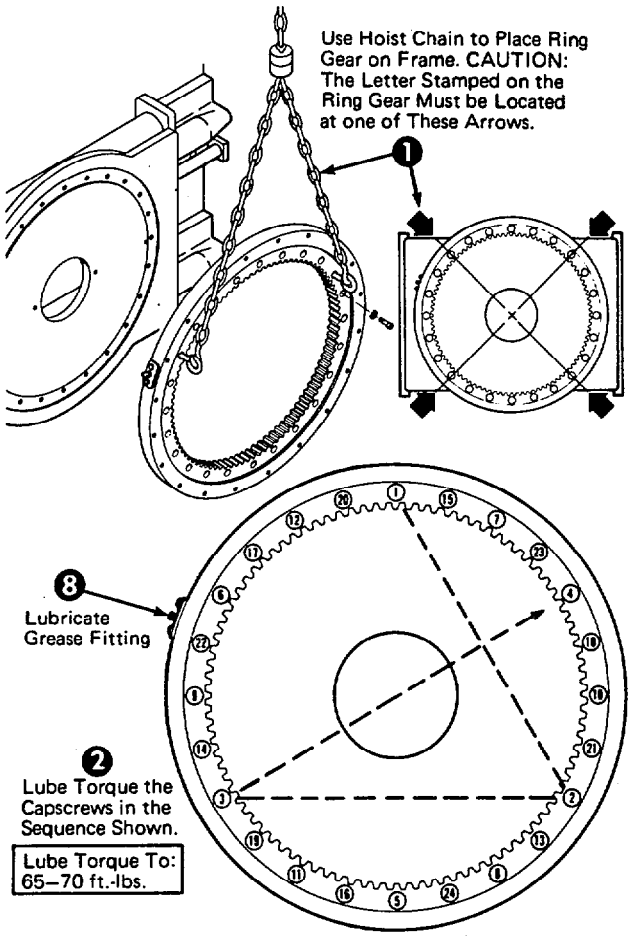
3. Using the hoist chain, lift the baseplate into position on the bearing race.

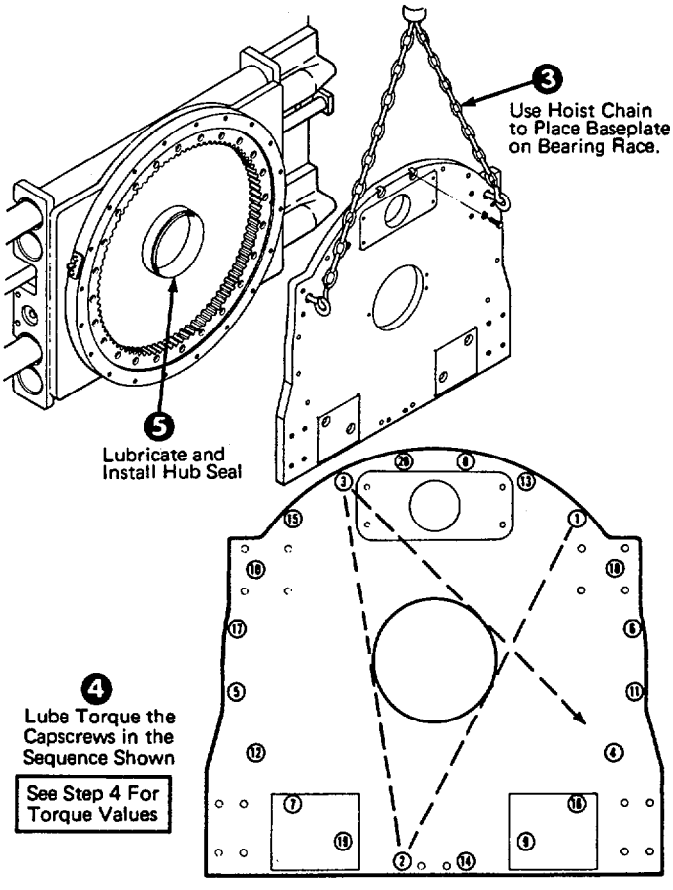
4. Lube-torque the capscrews in the order shown (some units may have a different quantity of capscrews). Use torque values as follows:

C3P and C4P	65-70 ft.-lb.
C6P	55-60 ft.-lb.

> **WARNING:** The capscrews that secure the baseplate to the bearing race must be grade 5 minimum.

5. Lubricate and install the hub seal.
6. Reinstall the revolving connection. See Paragraph 5.6-2.
7. Reinstall the rotator drive group. See Paragraph 5.8-1.
8. Lubricate the bearing race through the grease fitting on the ring gear/bearing assembly (baseplate on C3P clamps).
9. Install the attachment on the truck as described in Section 2.

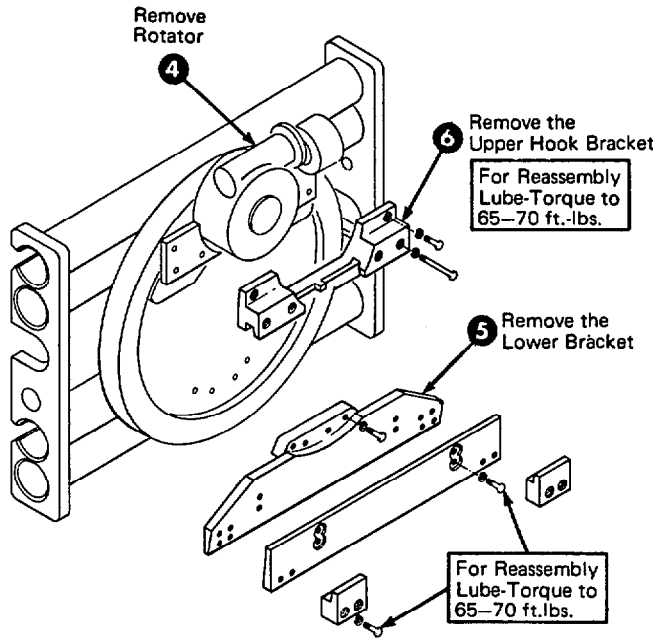

Use Hoist Chain to Place Ring Gear on Frame. CAUTION: The Letter Stamped on the Ring Gear Must be Located at one of These Arrows.
1
8
Lubricate Grease Fitting
2
Lube Torque the Capscrews in the Sequence Shown.
Lube Torque To: 65–70 ft.-lbs.


3
Use Hoist Chain to Place Baseplate on Bearing Race.
5
Lubricate and Install Hub Seal
4
Lube Torque the Capscrews in the Sequence Shown
See Step 4 For Torque Values

5.11 Frame Assembly, C5P Models Only

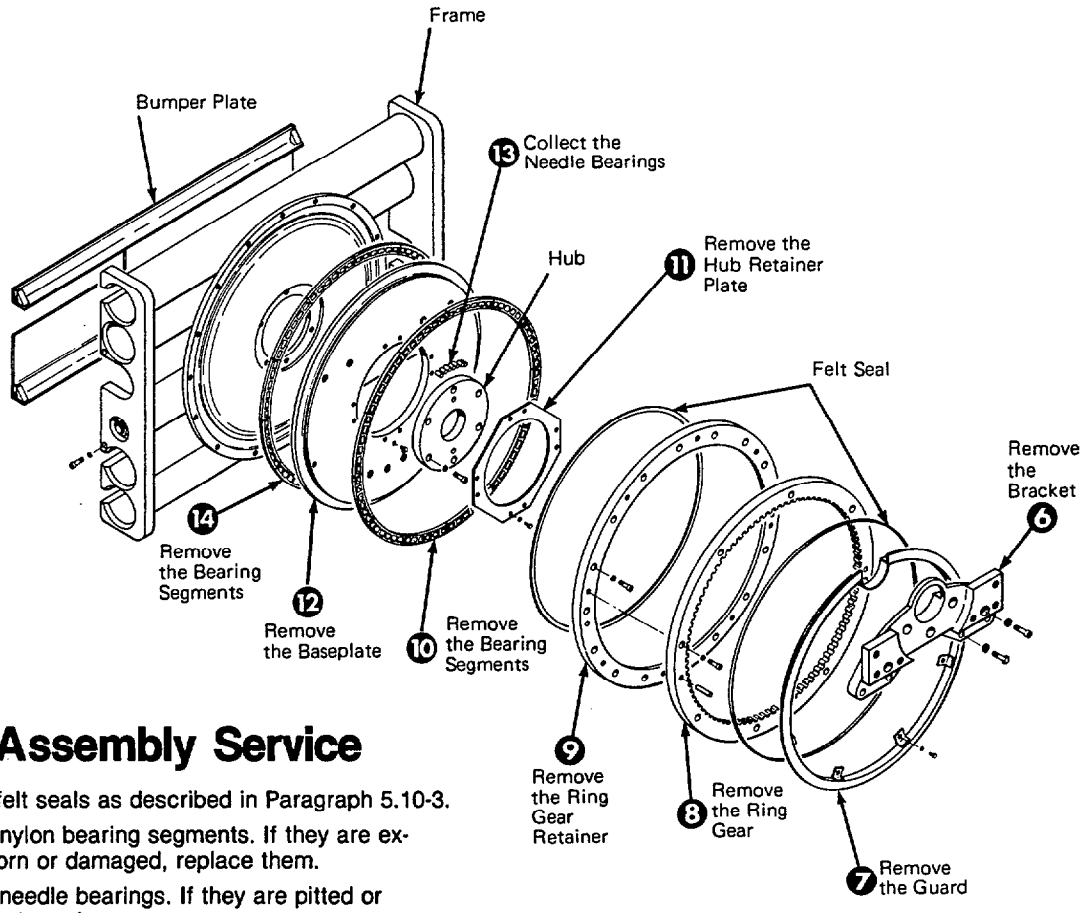
5.11-1 Frame Disassembly and Reassembly

1. Remove the arms as described in Paragraphs 5.2-1 and 5.2-5.
2. Remove the attachment from the truck as described in Paragraph 5.1. Lay the attachment on the floor with the back side facing up.
3. Remove the revolving connection as described in Paragraph 5.6-2.
4. Remove the rotator as described in Paragraph 5.8-1.
5. Remove the lower bracket.
6. Remove the upper hook bracket.


Remove Rotator
4
6 Remove the Upper Hook Bracket
For Reassembly Lube-Torque to 65—70 ft.-lbs.
5 Remove the Lower Bracket
For Reassembly Lube-Torque to 65—70 ft.lbs.

5.11-1 Frame Disassembly and Reassembly (Cont.)

6. Remove the upper revolving connection bracket.
7. Remove the guard.
8. Remove the capscrews securing the ring gear to the ring gear retainer. Replace two capscrews with eyebolts. **Using a suitable overhead hoist and chain,** lift off the ring gear.
9. Remove the gear retainer using the same procedure as the ring gear.
10. Remove the twelve nylon bearing segments from the baseplate.
11. Remove the hub retainer plate.
12. Remove the baseplate.
13. Collect the needle bearings between the baseplate and the hub. There are 86 of them.
14. Remove the twelve nylon bearing segments from the other side of the baseplate.
15. Clean all components.
16. Reassembly is a reverse of disassembly. Liberally lubricate the 86 needle bearings with graphite-base grease.
17. Install the attachment onto the truck as described in Section 2.



5.11-2 Frame Assembly Service

1. Install new felt seals as described in Paragraph 5.10-3.
2. Inspect the nylon bearing segments. If they are excessively worn or damaged, replace them.
3. Inspect the needle bearings. If they are pitted or damaged, replace them.
4. Inspect the faceplate and the baseplate. They must be flat within 0.030 inch.

Section 6 Standard Labor Times

6.1 Standard Labor Time is the average time required to perform each operation described in Section 5, Service. Each Standard Labor Time is identified by the Service Section paragraph number and title that corresponds to that operation.

The Standard Labor Times are based on the assumption a qualified serviceman is working on a reasonably clean attachment with adequate tools. We realize the actual time required to perform an operation may occasionally be greater than that listed, especially if a "first time" serviceman lacks the needed tools, or if a bolt is frozen. But considering all factors that can affect the job, Cascade can only honor warranty labor claims based on these carefully evaluated averages.

We strongly urge servicemen to read the applicable Service Sections of the manual before repairs are initiated. If problem diagnosis is difficult, call the Cascade Service Department at 1-800-547-5266 (toll free), or, in Oregon, call 666-1511.

To arrive at the total Standard Labor Time for a job, list each operation and add the times. As an example, to replace bushings, your list should look something like this:

5.1	Clamp Removal and Installation	1.0
5.2-1	Arm Removal and Installation	1.0
5.2-9	Arm Bushing Replacement	1.0
	Total Standard Labor Time	3.0

6.2 Standard Labor Times

Paragraph Number		Times
5.1	Clamp Removal and Installation	1.0
5.2-1	Arm Removal and Installation	1.0
5.2-2	Arm Disassembly and Reassembly, Long and Short Arms	1.0
5.2-3	Arm Disassembly and Reassembly, Link-Type Swing Arms	1.0
5.2-4	Arm Disassembly and Reassembly, Cam-Type Swing Arm	1.4
5.2-5	Arm Disassembly and Reassembly, C5P Swing Arm	2.0
5.2-6	Arm Disassembly and Reassembly, Old Style C4P and C4S Dockhands	0.8
5.2-7	Arm Disassembly and Reassembly, New Style C4P and C4S Dockhands	0.8
5.2-8	T-Bar Arm Base/Arm Carrier Disassembly and Reassembly	0.8
5.2-9	Sliding Arm Bushing Replacement, Two Piece Style	1.0
5.2-10	Sliding Arm Bushing Replacement, One Piece Style	1.0
5.2-11	Wear Bar Installation	0.5
5.3-1	Cylinder Removal and Installation	0.5
5.4	Cylinder Service	0.8
5.5-1	Restrictor Fitting Service	0.5
5.5-2	Restrictor Fitting Adjustment	0.5
5.6-1	Revolving Connection, Cartridge-Type Check Valve Service	0.7
5.6-2	Revolving Connection (and C5P Check Valve) Removal and Installation	1.0
5.6-3	Revolving Connection Service	0.9
5.6-4	Check Valve Service, C5P Clamps Only	0.5
5.7-1	Sideshifting Check Valve Removal and Installation	0.5
5.7-2	Sideshifting Check Valve Service	0.6
5.8-1	Rotator Drive Group Removal and Installation	0.5
5.8-2	Rotator Drive Group Disassembly and Service	1.5
5.8-3	Rotator Drive Group Reassembly	1.5
5.9-1	Motor Removal and Installation	0.8
5.9-2	Motor Disassembly, Service and Reassembly	1.0
5.10-1	Frame Assembly, All Models Except C5P and C4S Sideshifting Dockhand, Baseplate Removal	1.0
5.10-2	Ring Gear/Bearing Assembly Removal	1.0
5.10-3	Frame Assembly Service	1.0
5.10-4	Frame Reassembly	2.0
5.11-1	Frame Disassembly and Reassembly	3.0
5.11-2	Frame Assembly Service	1.0

Do you have questions you need answered right now? Call your nearest Cascade Service Department.

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